JUNE 1952

PRECISION METAL MOLDING

INCLUDING DIE CASTINGS MAGAZINE

DIE CASTINGS
INVESTMENT CASTINGS
POWDER METALLURGY
PERMANENT MOLD CASTINGS
PLASTER MOLD CASTINGS

PMM

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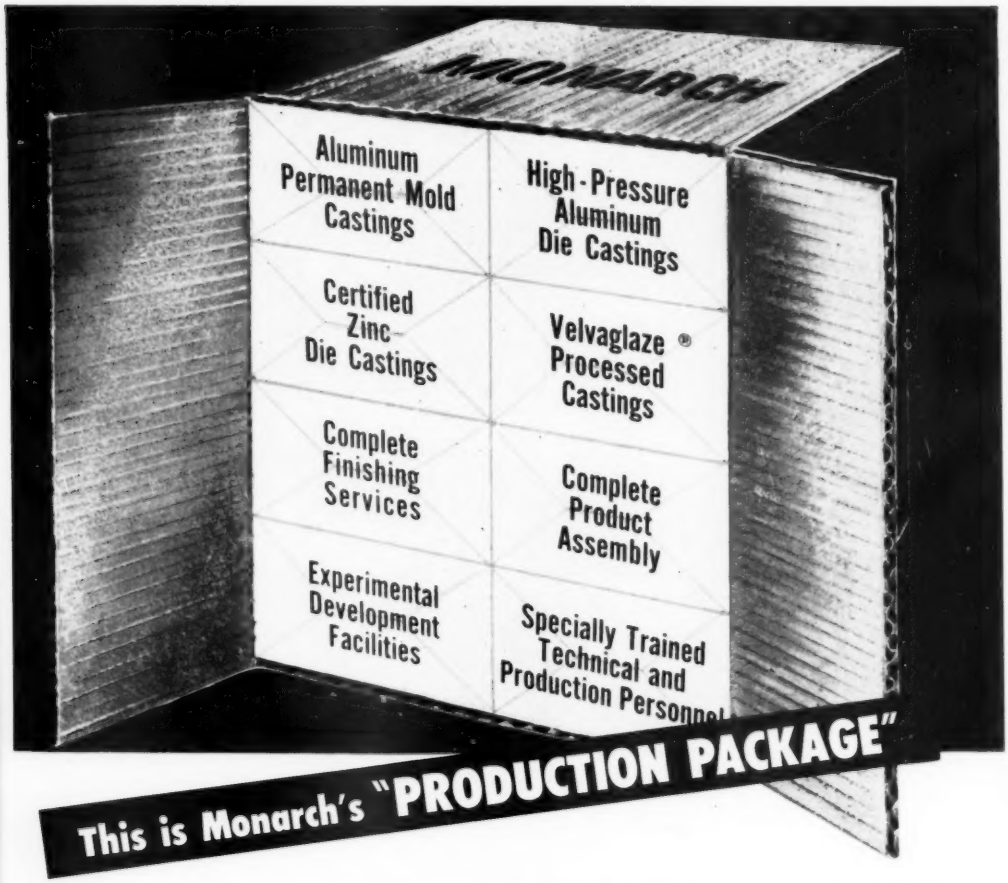

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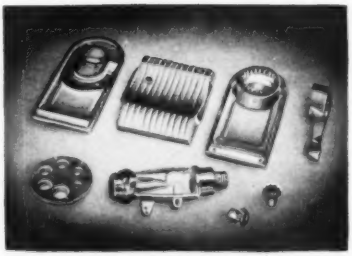

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In designing their new Dexter model, the Automatic Pencil Sharpener Company considered appearance, performance and production of equal importance. To assure results as outstanding as the deluxe new Dexter has proved to be, Automatic chose KUX die casting equipment.

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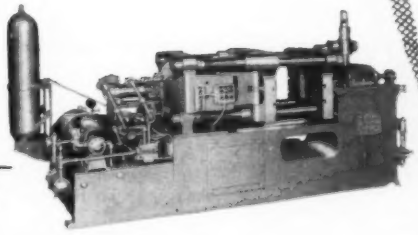

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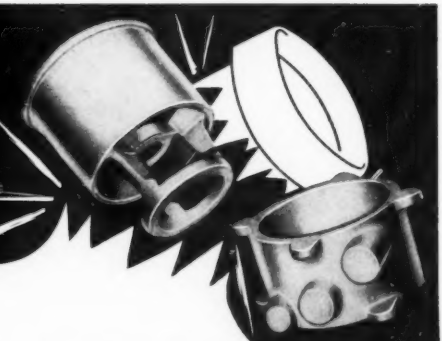

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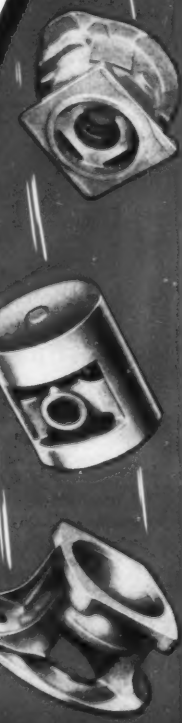

Our Bulletin No. 20-A completely describes our facilities in detail. Free copy on request.

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CINCINNATI 25, OHIO

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ALUMINUM PERMANENT MOLD and SAND CASTINGS . . . HARDENED, GROUND and FORGED STEEL PARTS

JUNE 1952
Vol. 10 No. 6

PRECISION METAL MOLDING

DIE CASTINGS • INVESTMENT CASTINGS • POWDER METALLURGY
PERMANENT MOLD CASTINGS • PLASTER MOLD CASTINGS

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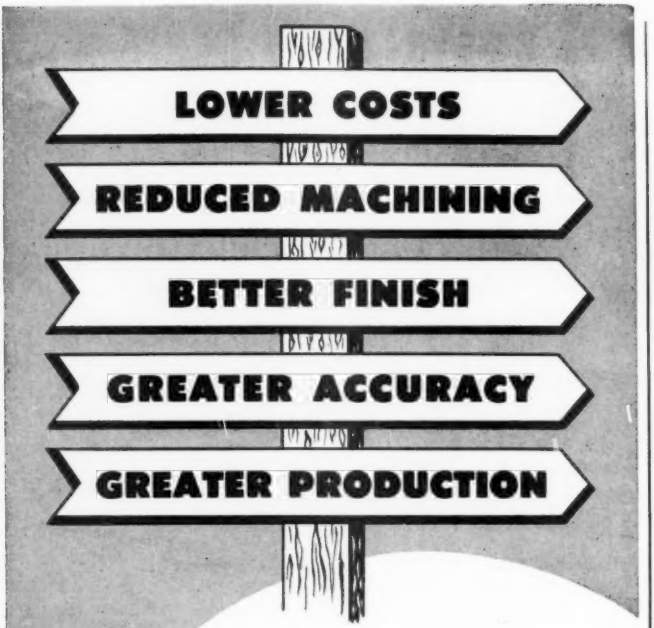

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You can be sure you are headed in the right direction when you bring your die casting problems to Newton-New Haven. Here is an organization that has the equipment, the personnel, the experience and the whole-hearted desire to help.

Newton-New Haven has prepared a booklet on "Dimensioning Die Castings." This is a basic data that every Engineer and Designer should have. Write on your company letterhead for your copy.

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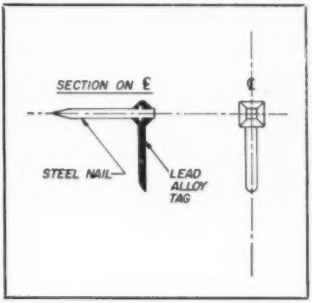
LETTERS TO THE EDITOR

DIE CAST LEAD TAGS

We are endeavoring to obtain information on the large scale manufacture of horticultural "cleat" nails such as those shown in the attached sketch, and are particularly interested in the



process of attaching the lead alloy tags to the heads of these.

We believe that this operation is commonly carried out in a die casting machine, and should be very grateful for any information or references to published work on this subject.—S.H.S. (England)

We are not familiar with the horticultural cleat, but do not see any reason why the lead tag couldn't be die cast with the cleat nail as an insert. There are some small die casting machines well suited for the purpose, and there are also some die casters who are equipped to cast lead alloy to meet your needs.—Ed.

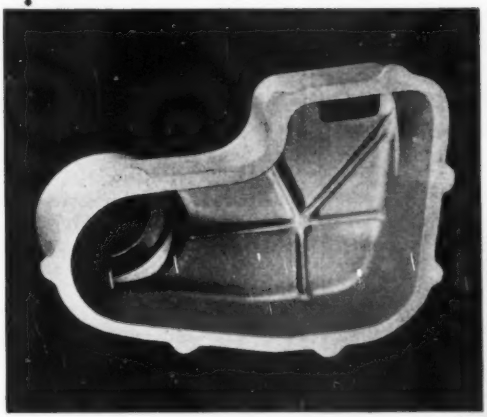
POWDER METALLURGY DIRECTORY

Reference is made to your April, 1952 issue in which you have included "A Directory of the Powder Metallurgy Industry." The compilation appears to be complete, and is invaluable to the buyer in its method of categorizing the various types of sources.

I have need for a similar listing of sources in the precision

continued on page 6

FOR PEACE



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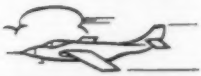

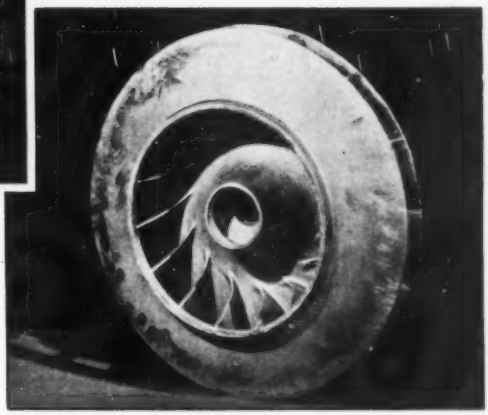

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has the experience

FROM a single source you can get aluminum alloy permanent mold and semi-permanent mold castings, plus aluminum and magnesium alloy sand castings.

During World War II Acme produced a wide variety of castings for aircraft and aircraft accessories and for numerous complicated ordnance parts. Production on some of these parts has never been discontinued.

This experience and our engineering knowledge is available to you. Acme engineers will work with you on problems of design, cost of producing samples, production costs and cost of patterns or permanent molds to produce high quality castings.

A COMPLETE LIGHT METAL CASTINGS SERVICE

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ALUMINUM FOUNDRY CO.

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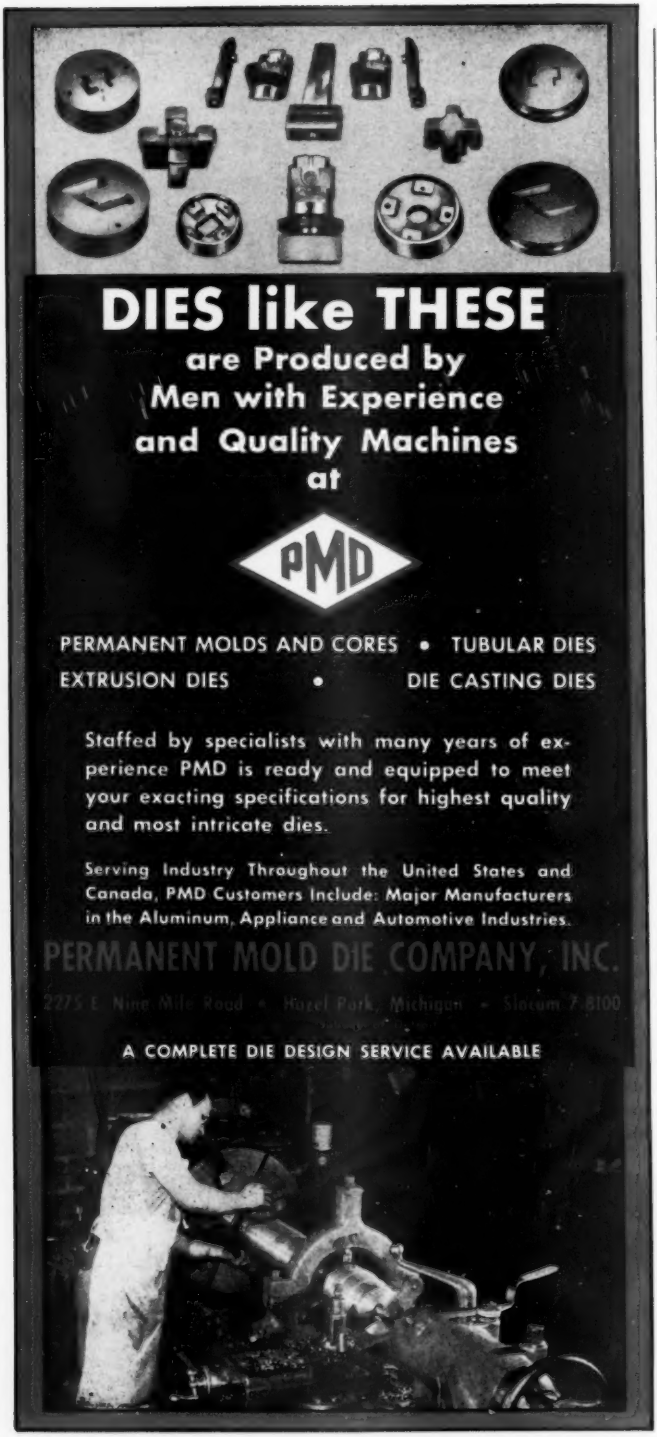
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investment casting and the plaster mold casting industries. If such a directory has been compiled, I would appreciate having a copy.—R.P.S.

So far, we have not compiled and published such a directory, but are contemplating it at the present time. If such a directory should appear to be feasible, it would appear as a regular feature in PMM.—Ed.

IMPRESSIVE ISSUE

It was a very impressive issue of PRECISION METAL MOLDING that reached my desk yesterday. I certainly think that the Directory of the Powder Metallurgy Industry was worth the time and effort it took to prepare it. Are you planning to make reprints available?—C.R.M.

The reaction to the first Powder Metallurgy directory has been very gratifying, and demonstrates that there was a need for such a listing. Although the directory is not being reprinted, we have had extra copies of the April issue printed and these can be obtained while the supply lasts.—Ed.

SILICON AFFECTS ANODIZING

Regarding the article on "Black Anodizing of Aluminum die castings," which was run in the March issue of P.M.M., there is no mention of the effect of silicon on this process. It has been our experience that silicon prevents an even finish and generally makes anodizing unsuitable as a decorative finish on any aluminum die castings. Perhaps the Acme Plating Company has overcome this difficulty? Any further information you can furnish us will be greatly appreciated.—R.E.S.

We have checked with Acme Plating Co. who are doing the anodizing, and received this information: "The statement that silicon prevents an even finish and generally makes anodizing unsuitable for decorative finish is correct. The parts about which the article was written have an industrial application

continued on page 42

ALUMINUM DIE CASTING ALLOYS

Aluminum alloys produced under quality controlled methods are specially designed to meet your die cast, permanent mold, or sand casting requirements.

For prompt dependable deliveries of quality aluminum in any quantity, write to

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fine feathered edges

Aluminum die casting
about 2/3 actual size

fill better on a LESTER

The part shown here is a die cast aluminum impeller for a new automotive transmission. Rising from a cylindrical wall are eleven spiral blades which taper from 1/4" thick down to .045". It's a tough bird to cast. But even though other engineers told them it couldn't be done, Manor Die Cast Corp. of Cleveland has been running the job for months on their HHP-3X Lester-Phoenix machine equipped with a Pre-fill.

The unusual flexibility of speed and pressure in the Lester Pre-fill system, coupled with the tremendous clamping abilities of the beam-type frame, gives Manor a decided competitive advantage: *the blades are cast up to .010" THINNER than the same part run on competitive equipment, resulting in marked improvement in the transmission's performance.*

Yes, birds of a feather flock together—superb die making, top-notch die casting technique, and the finest of equipment—Lester-Phoenix Die Casting Machines. Write for catalog and specification sheets and copy of the Lester Press.

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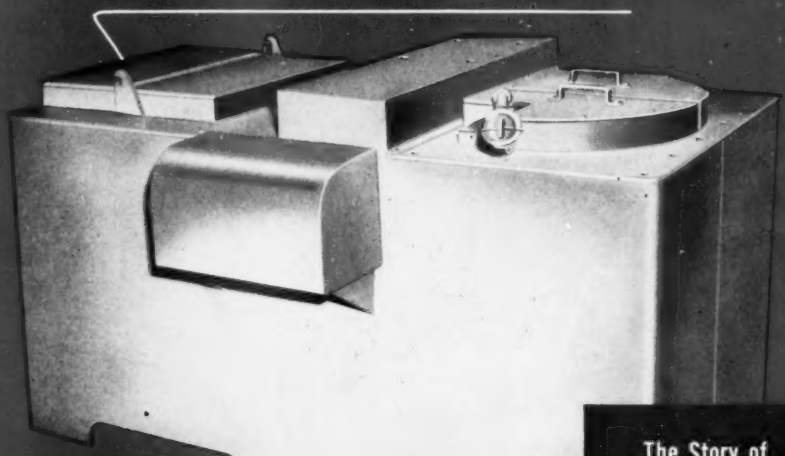

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- . . . confines impurities to the charging chamber.
- . . . eliminates channel clogging with "Channel Flushing".
- . . . minimizes metal losses because the metal is heated from the inside out.
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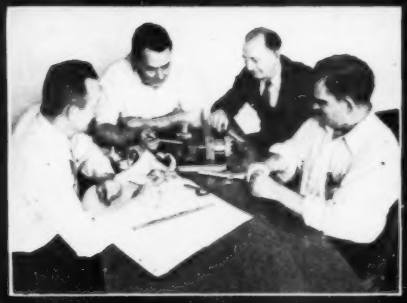

Why? One good reason is Bill Brown, our plant manager, a veteran of more than thirty years in the die casting industry.

Bill is continually developing more expedient methods for the efficient production of die cast parts.

Bill and his staff are noted for engineering and building ingenious production tools and solving production problems with one end result—better die castings.

This valuable talent and experience is available to all PRESSURE customers.

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PRESSURE CASTINGS, INC.

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Since the inception of die casting the automotive industry has been, by far, the largest user of zinc alloy die castings. This is not surprising as ease of casting and finishing, as well as the physical characteristics of zinc base alloys, provides the ideal metal for automotive hardware and a great variety of functional parts.

ZINC ALLOY DIE CASTINGS

Percent of 1951 Sales by End Uses
(Based on Estimates of AMERICAN DIE CASTING INSTITUTE covering Jobbing Die Casters only)

INDUSTRY & PRODUCT	% POUNDS SHIPPED
Transportation—Motor Vehicles	47.2
Household Appliances, Furnishings, Equipment	18.3
Mining, Construction, Agricultural Machinery, Commercial Machines & Equipment	11.5
Plumbing, Heating & Builders Hardware	5.4
Office Machines, Photographic, Optical & Scientific Instruments & Equipment	4.6
Communication Equipment, Electronic & Timing Devices, Clocks, Vending Machines, etc.	3.1
Sporting Goods, Jewelry, Toys, etc.	1.3
National Defense	9.6

Other industries have found similar advantages in the adoption of zinc die casting for their respective products. This is evidenced by the fact that nearly 75% of all die castings by weight are based on zinc.

- **DIE CASTING is the Process**
- **ZINC, the Metal**
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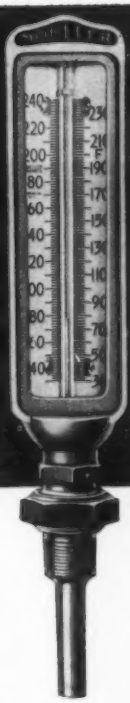


CASE HISTORIES FROM MT. VERNON FILES

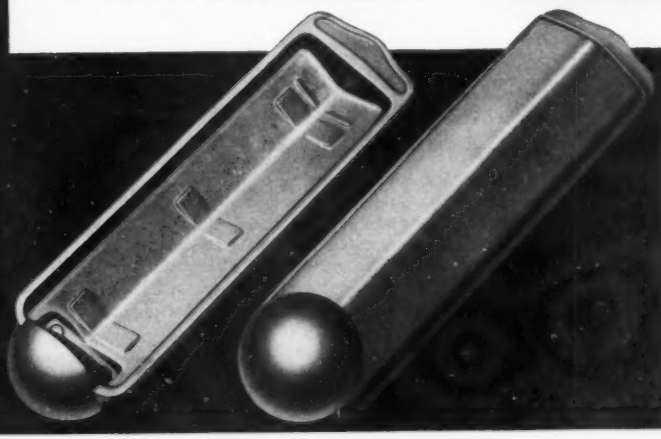
Die casting is industry's high speed producer. Not only simple parts, but really difficult ones are "naturals" for the die casting process —and they are produced fast. Yes, it *pays* to remember die casting when you're long on orders and short on time.

But that's only one angle. Die casting means savings and satisfaction whenever you employ it—actual cutting of production costs, and highly satisfactory products superior in performance and appearance.

Look at this versatile thermometer job. Moeller Industrial Thermometers required a neat-looking housing that could be easily installed in a variety of positions to suit different applications. Provision of a spherically-shaped base, which can be drilled at any angle to accommodate a tubular mount, has solved the design problem. And Mount Vernon die casting handles the production problem—by turning out these V-shaped housings rapidly and accurately; so clean that subsequent machining, other than drilling of mount hole, is unnecessary.

Whether the product you're planning to manufacture is simple or complex, it will profit you to consider die casting—and consult with us. With our long experience, specialized knowledge, and modern facilities we are in an excellent position to help you solve your production problems and give you top quality service.

MT. VERNON
DIE CASTING CORP.
MT VERNON NEW YORK



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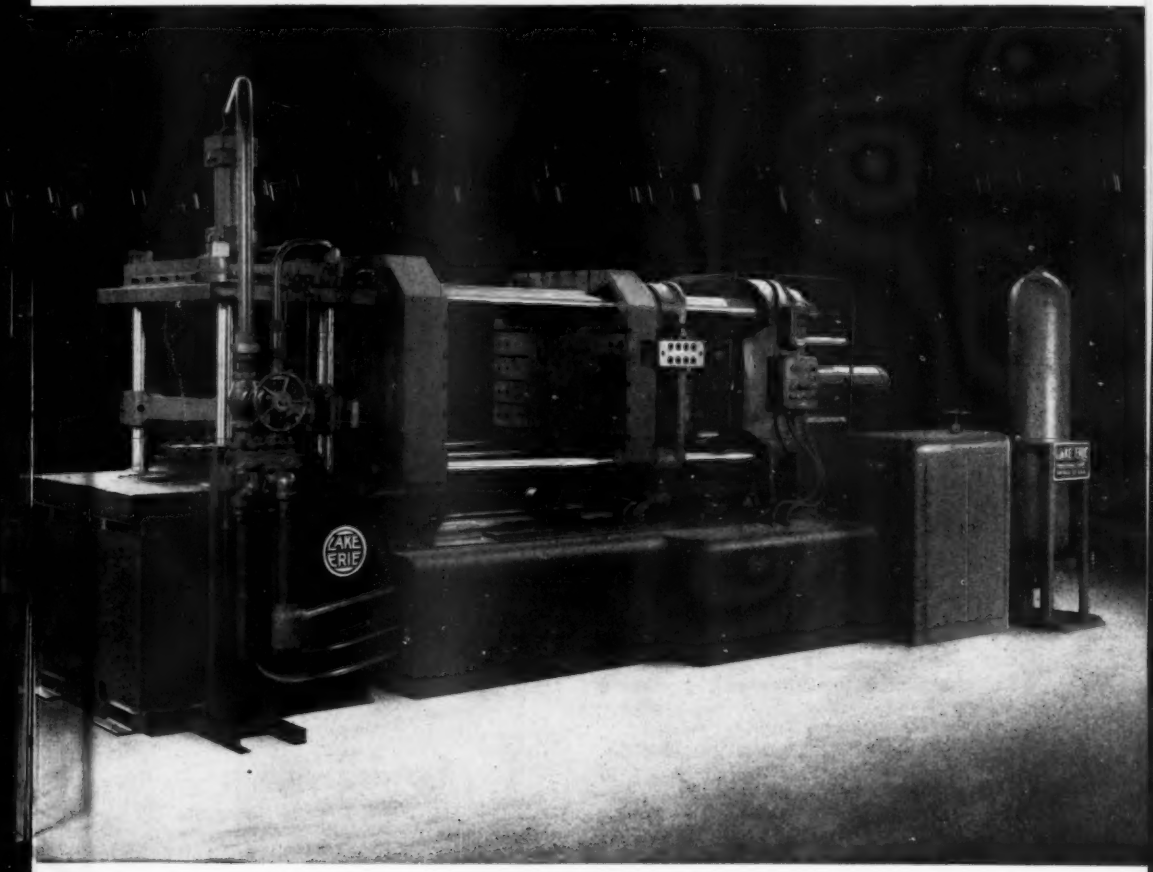

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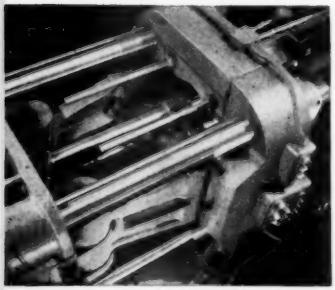
Lake Erie Die Casting Machines set new standards in hourly production and finished casting costs



The "Wedge Cam Toggle" is an exclusive Lake Erie Engineering design.

"WEDGE CAM TOGGLE" The revolutionary Lake Erie "Wedge Cam Toggle" has provided a new standard of comparison for increased die casting production. This self-compensating toggle clamp automatically takes up clearances in the dies due to contraction and expansion of the molds during production or shut-down periods, and, at the same time, engages and disengages easily without binding. This is accomplished by the use of a circular cam contact surface together with rolls which guide the toggles during engagement and disengagement. The toggle action is actuated by a hydraulic cylinder which provides smooth, rapid opening and closing.

"PRESSURE PAC" This patented unit consists of automatic pressure booster in the hydraulic circuit between the accumulator and the injection cylinder. It provides the necessary pressure to feed the shrink or compress the porosity at the time of solidification of the metal. The standard unit is arranged for 2-to-1 pressure increase. Special units are available for higher pressure ratios.

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To Die Casting Problems

by LAKE ERIE ENGINEERING CORP. BUFFALO, N.Y. U.S.A.

...these new die casting machines have increased production 15% to 25%

Lake Erie's patented "Wedge Cam Toggle" and "Pressure Pac" injection unit provide the industry with the first major improvements in die casting machines in many years. In addition to these two *exclusive* contributions to improved production, Lake Erie Die Casting Machines incorporate a number of other engineering advancements—all of which combine to give you die casting equipment which through its increased earning power makes other machines obsolete.

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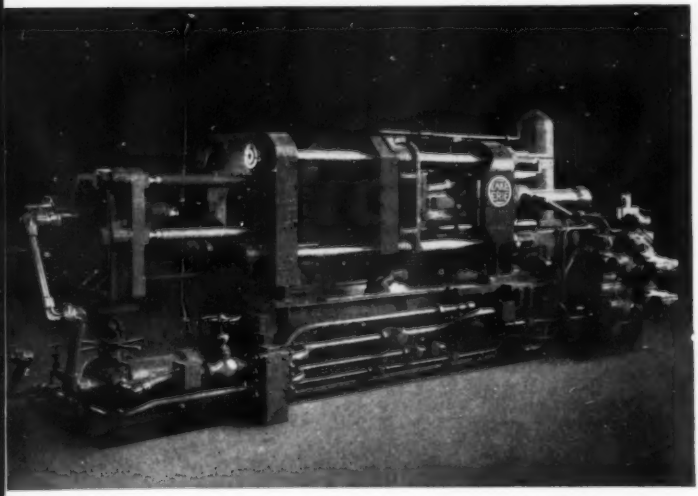

With all shrouding removed the clean, sturdy construction of Lake Erie Die Casting Machines is self-evident. All parts easily accessible.

OPERATING FEATURES

- **Patented "Wedge Cam Toggle"**

  Self-compensating adjustment for heat expansion.

  Increased hourly production due to positive clamping pressure during each machine cycle.

- **Patented "Pressure Pac"**

  Feeds the shrink or compresses porosity during solidification of aluminum, magnesium and brass.

  Irons out the skin surface gas lines. Provides denser castings.

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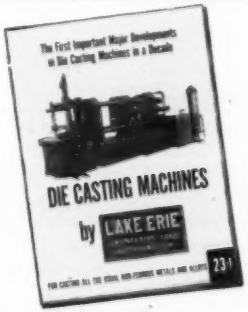
Write for this Catalog

Illustrations, specifications, application data—all are here in complete detail with full explanation of the patented "Wedge Cam Toggle" and "Pressure Pac" production advantages.



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PRESSURE PAC ®

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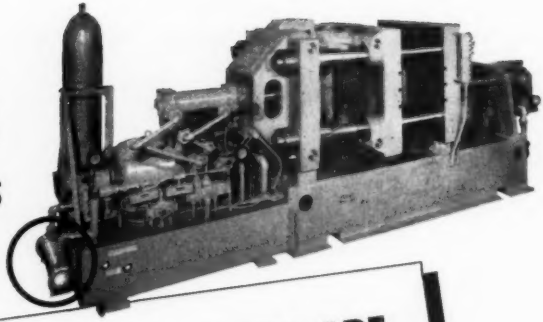

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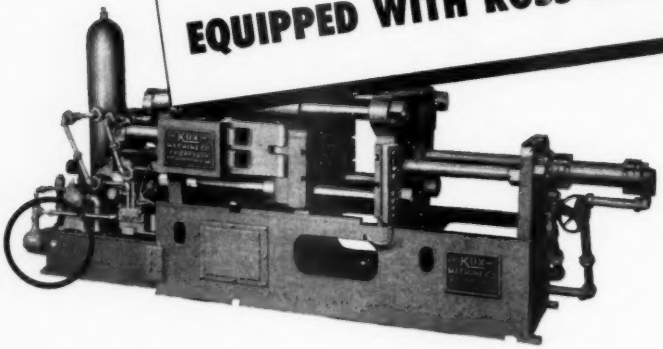

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But, dependability is only half the story of the Ross "BCF's" widespread use in the hydraulic machinery industry. The fact that it is a pre-engineered, completely standardized and mass produced exchanger counts heavily wherever time and costs are important considerations, too.

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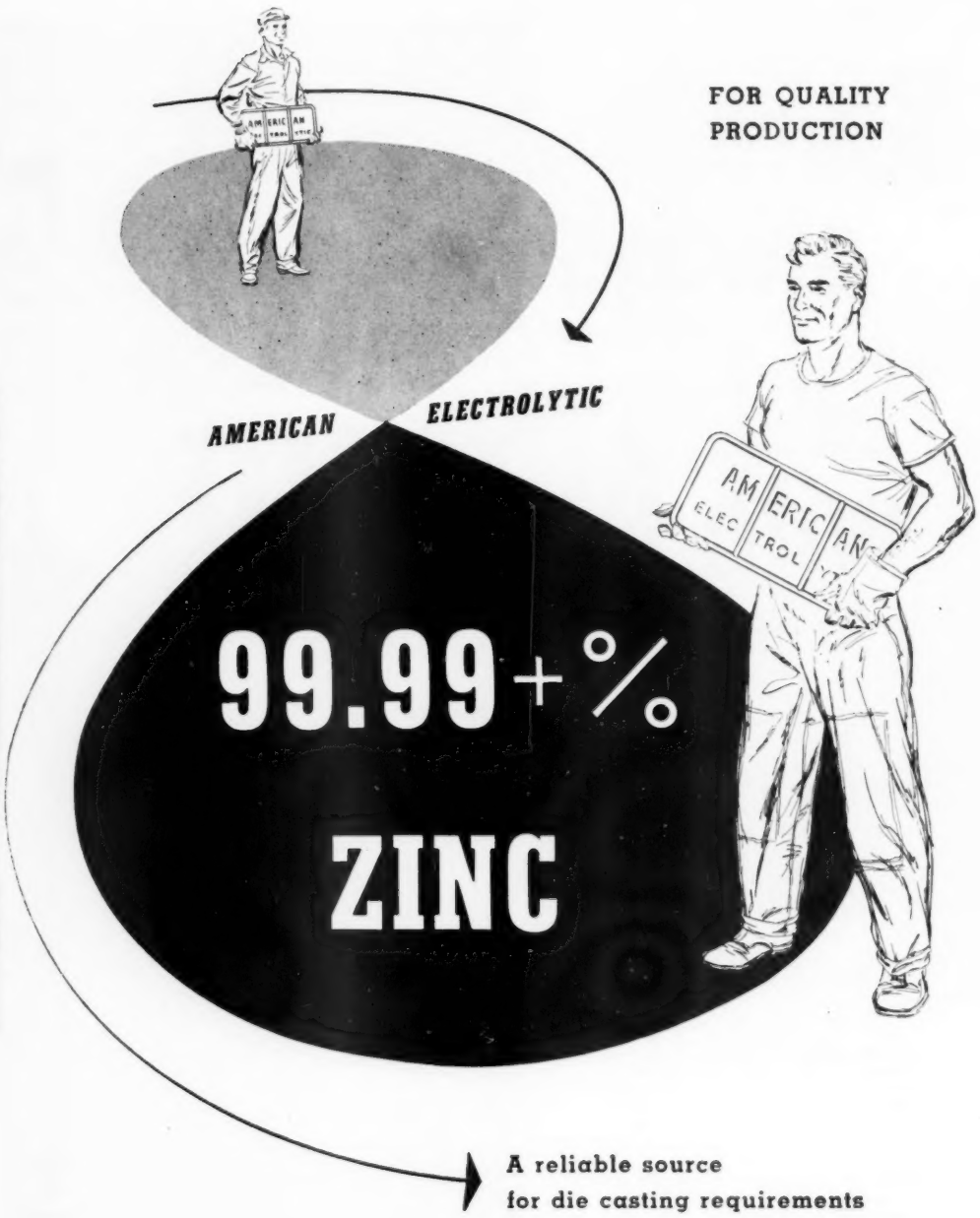

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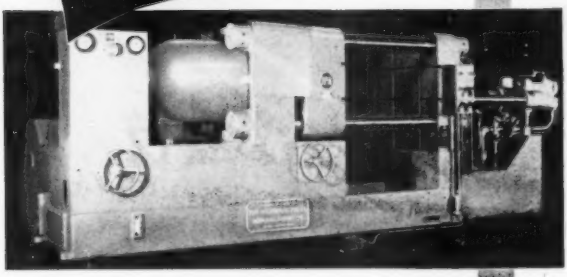

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THE H-P-M ALL-HYDRAULIC MOLD CLAMP, guided by four strain rods, assures positive mold alignment. Die change-over is simple and fast. Both clamp stroke and pressure are adjustable. Positive overload protection is provided at all times. High speed closing and opening, with automatic slow-down prior to mold contact, guarantees fast, shockless operation.

H-P-M AUTOMATIC CYCLE CONTROL permits maximum production. Manual effort has been minimized. Electric hand switches control mold clamp, hydraulic ejector and core pulls. A single Multiflex timer controls the automatic cycle after metal has been ladled into "cold" chamber. A selector switch is provided for manual operation of entire cycle, if desired.

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SPECIFICATIONS

	MODEL NUMBER				
	150—A	150—Z	400-A-M	400-A-S	400—AV
SIZE OF DIE PLATES	24½x24½	24½x24½	38x38	45x45	36x36
SPACE BETWEEN BARS	15½x15½	15½x15½	23x23	30x30	36x36
DIE OPENS	12	12	16	16	20
MAXIMUM DIE SPACE	28	28	42	42	42
CAPACITY PER SHOT (LBS.)	4 (AL)*	10 (ZN)	12 (AL)*	12 (AL)*	12 (AL)*
NET WEIGHT (LBS.)	13000	16000	40000	44000	33000

*NOTE: These models handle brass and magnesium die castings as well. Complete specifications on request.

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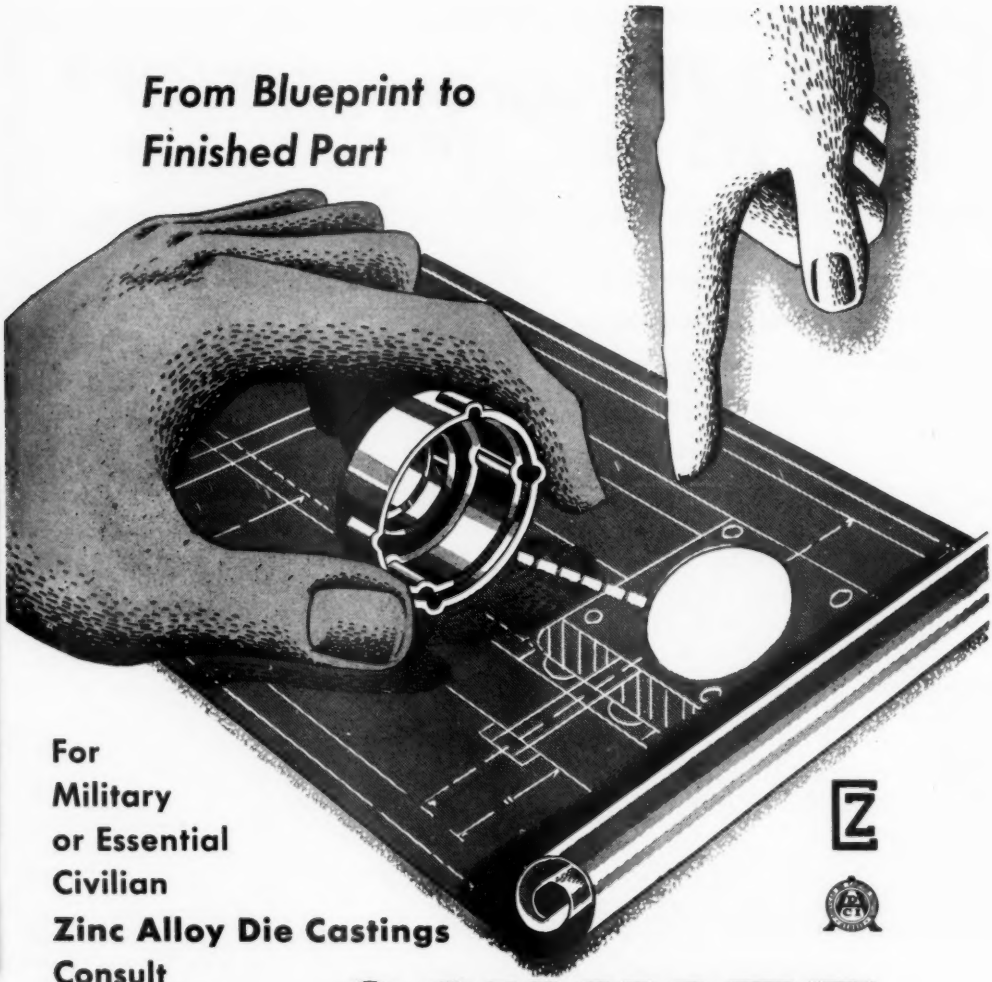

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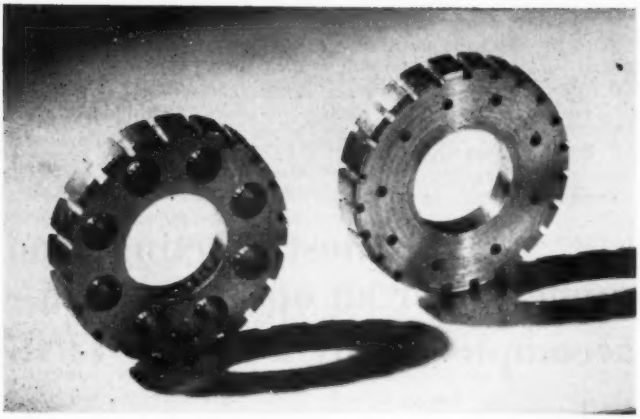


COST REDUCTION of 40% has been achieved by redesigning the shower head disc from machined bar stock, right, to powdered metal, left. Notice redesign of the small holes to permit coring.

Problem of coring small holes solved by POWDER METALLURGY

By FRED O. SCHULZ
Purchasing Agent
Milwaukee Flush Valve Co.

THE molding of parts with narrow slots and the coring of small holes has always been one of the more difficult problems of powder metallurgy. When the slots are only 0.040 inches wide and the holes have a diameter of only 0.040, the problem becomes particularly difficult. These were the conditions faced by the U.S. Graphite Co. of Saginaw, Michigan, when they were asked by Milwaukee Flush Valve Co. of Milwaukee, Wisc., to fabricate a shower head disc out of metal powders.

The disc had formerly been made by machining from one inch diameter brass bar stock. This original disc is shown above right. The sequence of operations involved in making the disc were:

1. Machine to diameter and cut off, Drill center hole
2. Drill eight 0.040 dia. spray holes
3. Mill twenty slots 0.040 wide around circumference
4. Barrel tumble to debur
5. Chromium plate

To make this piece of metal powder required some minor redesign of the sort that is frequently found when changing to powder metallurgy as a manufacturing method. The chief difficulty lay in coring the eight 0.040 diameter spray holes. Even in a piece as thin as this one, such small core rods were a constant source of trouble. The part was, therefore, redesigned as shown above left. The spray holes instead of being the same diameter all the way through the disc, were counterbored except for the last 0.040 inches of their length. This change allowed building a die with short, rather heavy core rods over most of the length and thus eliminated the breakage problem.

On the original spray disc, the holes were drilled parallel to the edge, not at right angles to the face of the disc. This sort of hole is, of course, not possible to core in powders. The second design change was, therefore, to make the holes perpendicular to the face of the disc.

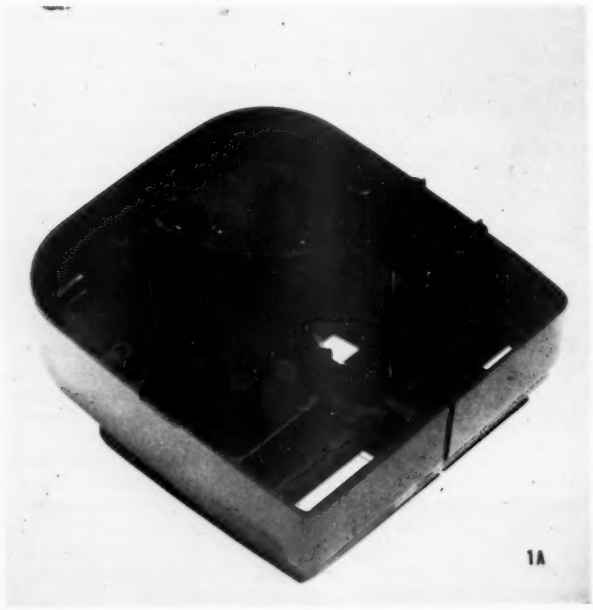
Except for these two changes, the discs were made to the same dimensions and the same tolerances as the machined ones they now replace.

Another step was taken to lower the manufacturing cost still further. Where the older discs were of brass, chromium plated, the new ones are nickel bronze. This alloy appears the same as the chromium plated disc and eliminates the need of the plating operation.

The result of the changes has been a disc that is used as received from the fabricator. There are no rejects due to dimensional inaccuracies, burs or poor plating and the cost of the spray disc ready to assemble in the shower head is 40 percent less than a comparable disc machined from bar stock.

The most exacting kind of mounting alignment—for an optical system—accomplished by DIE CASTING

A MULTIPLICITY OF BOSSES and pads, with accurately centered cored holes, can be provided by the die casting process, to form this highly accurate mounting base for an optical system. Because the majority of the critical dimensions fall in the same half of the die, it is possible for the die caster to maintain somewhat closer than normal control over accuracy. Flatness—another consideration in this type of casting—requires special attention to the location of ejector pins in the die.



ANY piece of equipment containing a good optical system must have as a basis, an accurately made, rigid mounting for the various optical components. Within the focusing ability of the equipment, the mounting must be stable over the temperature range of normal use and must not change dimensionally with age. Adequate rigidity must be provided so that normal usage will not allow shift of any of the optics. Generally, the equipment must be amenable to surface conditioning operations so that the finished piece will present a pleasing appearance.

When all of these conditions are met by a single casting and, in addition, the amount of machining and surface finishing is reduced to an absolute minimum, one can say that the die casting process has been utilized to its fullest capacity.

The Kodaslide Table Viewer made by the Eastman Kodak Co. of Rochester, New York, is a good example of the maximum utilization of aluminum die castings.

The base casting (two views of which are shown in Figure 1) carries all of the optical components of the slide viewer. The light source, reflector, heat resistant glass and condensing lenses must be accurately aligned and housed in a light-tight box. In the viewer this is a die cast housing that is part of the main base casting. A portion of the cover is cast on while the balance is a part of the chimney, another die casting, that dissipates the heat from the projection lamp.

Optical system is aligned without machining the mounting unit

The other optical components, three mirrors and a projection lens are mounted on cast-in supports. A schematic view of the optical system is shown in Figure 2. As can be seen from the schematic drawing of the optical system, a very slight variation in mirror angle or a slight tilt of either the condensing lens or projection lens would throw the entire optical system out of line. However, this base casting as well as all other castings on this viewer are so accurately made by the die caster that *absolutely no machine work of any sort is required on the castings.*

When the castings are received from the foundry, they are buffed, polished, and spray painted and then go directly to the assembly line. Here the optical system is installed and such is the precision of the die cast parts that correct alignment of the components is achieved by using paper shims not over 0.010 thick.

Formed sheet metal clamps are used to hold the various parts of the optical system in place. Self tapping screws are used throughout and all of the holes for these screws are in the casting when it is received by Eastman from the foundry.

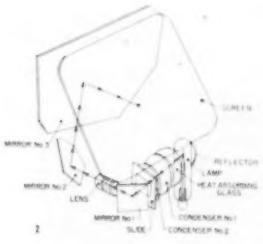
The large mirror which reflects the projected image onto the viewing screen is mounted on a separate die casting, Figure 3, which in turn is fastened to the main base casting with self tapping screws. The chimney for heat dissipation, also fastens to the main base casting in such a manner that the light-tight housing for the projection bulb is closed.

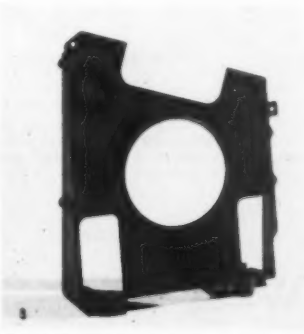
In connection with this chimney assembly, another advantage of the use of aluminum die castings can be noted. In spite of using a high wattage projection bulb, adequate heat dissipation is secured due to the high thermal conductivity of the housing. It is, therefore, not necessary to have a separate blower for cooling.

Thin-walled aluminum die casting

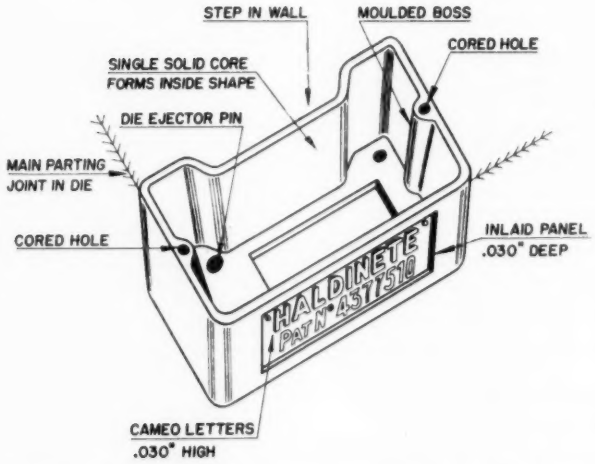
The case of the viewer, Figure 4, is also die cast aluminum. While the case appears to be a simple casting, it is difficult to make due to the great depth as compared with the wall thickness. Aluminum is notorious for being sticky; that is, it is extremely difficult to make it flow, especially in thin sections. When casting a part such as this cover, cold shuts are a problem to be overcome. The decorative trim at the bottom of the case helps in the casting since there is a somewhat heavier section there to feed the thin walls.

The viewer case is the one part of the entire assembly where any machine work is done. On this case, the four small holes in the front are drilled by Eastman after the castings are received. Other than this very minor operation, the casting is ready for polishing and painting as received.





How intaglio lettering and design are DIE CAST without retracting slides or loose cores



1. A NEW WAY to produce the cameo-type lettering on the side of this die casting without use of retracting slides is suggested in this article, based upon current die casting practice in England.

By W. M. HALLIDAY

WITH numerous kinds of die casting, features such as motifs, ornamental figuring inscriptions, lettering etc. have often to be employed partly for functional, or wholly for decorative purposes. Such inscriptive work may be required to furnish working instructions, trademark or patent designations, maker's name etc., or may be figuring for purely embellishment reasons.

Usually features of this character will be situated upon a *flat surface* of the die casting, whereon it may easily be moulded by reproduction from impressions on a core, or portion of die cavity which lies *parallel with the main parting-joint* of the die.

Location of this kind will be important, by ensuring the simplest form of die construction, and greatest ease when forming the impression in the die. It will also lead to the least amount of interference between the cast raised inscriptions on the part, and mating depressed hollows in the die.

Very frequently on certain types of castings, it may be desirable or necessary to situate lettering etc. on some *external surface*, using only slight relief for the raised (cameo) type letters. The amount of relief employed varies greatly according to the particular manner in which the lettered impressions are to be formed in the die. Impressions reproduced by the chemico - etching - photographic process may have relief as small as .003, while those produced by ordinary machining, or hobbing may have relief as much as .050. Usually it will not be necessary to employ such a pronounced degree of relief, and a good practical average value will lie between .020 to .032.

The reproduction of depressed or intaglio lettered impressions in the die cavity may sometimes present considerable difficulties for the die designer, by reason of the sides or character of surfaces on which they are to be located, and the relationship such surface bears to the main parting-joint and the normal line of ejection in the die.

If lettering etc. has to be moulded on some *side wall* of a casting lying at *right angles*, or at a steep inclination to the main parting joint, it might then be necessary to employ retracting slides, splints and similar detachable die members. These would be arranged to extend into the die cavity to the required depth, immediately prior to injection of molten charge, and moved out of that position before ejection of the casting.

Such design measures will be entailed to overcome the interlocking effect produced by engagement of raised letter impressions with the hollow intaglio impressions in the die members, which ordinarily would prevent smooth ejection of the finished piece.

Use of retracting slides or loose splits for such purposes, while quite feasible and indeed, very commonly adopted, generally will involve additional complication of the die construction. Similarly, because of the need to employ gears, cams, or levers for actuating such slide members etc, slower speed of operation of the die may result. Thus not only will the initial costs of the die manufacture be high, but unit costs per piece may be correspondingly inflated.

Many die designers do not appreciate that such lettering or inscriptive work, to be situated upon some external side surface of a component lying at *right-angles* to the parting joint of the die, and when required in slight relief, may often be effectively reproduced without resort to the conventional movable slides or similar die elements.

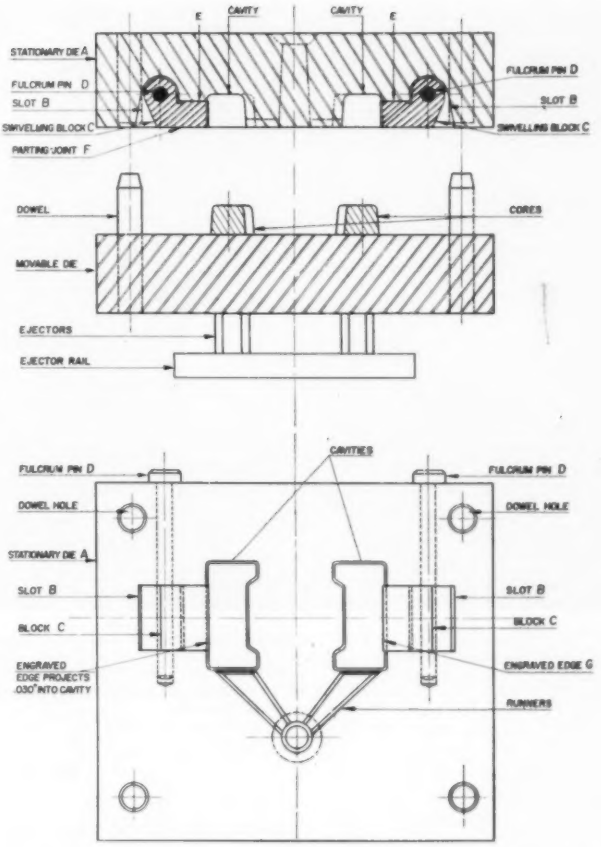
Cameo lettering on side of box-shaped casting

A typical example of such a die casting having these requirements is that shown at Figure 1. This is a hollow rectangular box casting produced in zinc base alloy. The rear long side is substantially stepped inwards for the full height of the wall as shown. A boss is formed vertically on each interior side wall, these portions extending fully to the floor of the casting, each being cored for a certain depth at the top (open) end of part for small holes, later to be machine-tapped.

The base-wall thickness of the casting had to be approximately .070 throughout, and the entire internal opening shape, and the two small holes being reproduced from cores mounted in the movable die half.

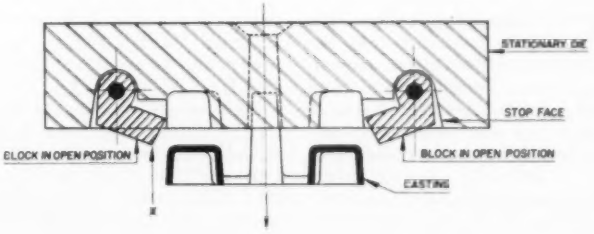
This casting was first produced devoid of any lettered inscription. This latter requirement arose as an afterthought on the part of the client, when several thousands of parts had been supplied. This request for a lettered inscription caused considerable consternation and some difficulties in view of the

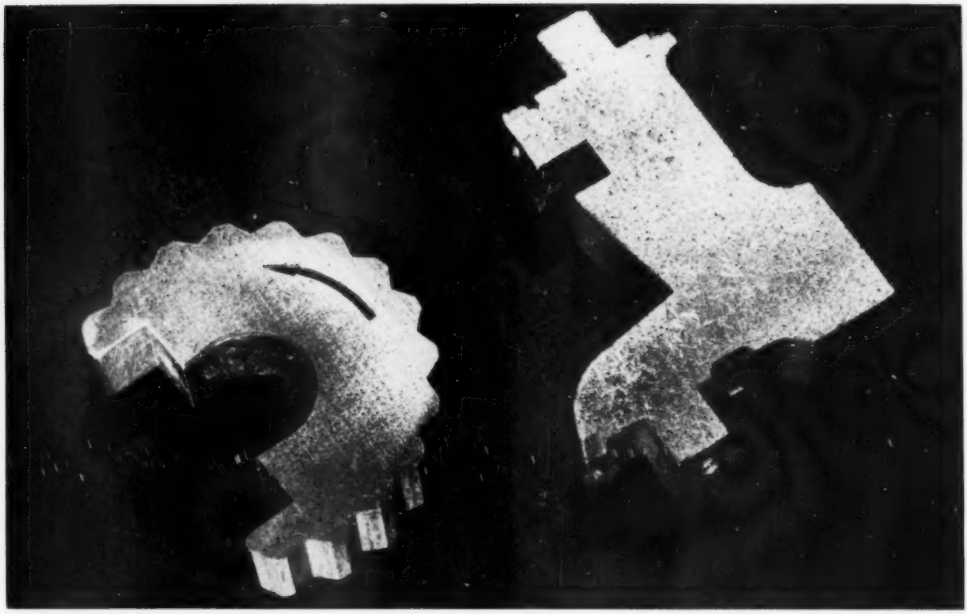
continued on page 78



2. SIMPLE, SWIVELLING BLOCKS are employed in place of retracting slides, as illustrated by the layout drawing, above, which shows the unusual system worked out for forming shallow recesses.

3. FORWARD MOVEMENT of the casting as it is ejected causes the swivel blocks to rotate outward, releasing the casting without extra rack and pinion action.





IN ADDITION TO THE POROUS METAL BEARINGS covered by specifications outlined below, International Business Machines Corp. also employs a large number of structural parts from powdered iron. Two of these parts are illustrated above, one a cam which would be difficult to produce by standard machining methods, and the other a part of a circuit-breaker subassembly. The latter was turned to powder metallurgy as a possible alternate for other metals in short supply.

Purchasing specs for POWDER METAL bearings meet MPA-ASTM standards

FOR many applications, the designer is able to take the published information regarding porous metal bearings and utilize it in his work. There arise cases, however, when the normally available data are not adequate. Since this condition occurs with reasonable frequency, the Engineering Standards Department of the International Business Machines Corp. found it desirable to publish their own standards bulletin.

This article will not attempt to give all of the material available in the International Business Machines Corp. standards. The information given below should be supplemented with both the Metal Powder Association and American Society for Testing Materials standards for porous metal bearings.

Applications:

Porous metal bearings are used successfully where leakage is a factor or when continuous lubrication or regular replenish-

ment of the lubricant supply is impractical. They are not recommended for use unless the design includes an auxiliary lubricating device, oil reservoir or other means of replenishing the initial supply of lubricant contained within the bearing. No oil holes or grooves are required.

Porous bearings are generally better than solid metal bearings for oscillatory motion.

Porous metal should not be specified when the bearing is subject to heavy load, shock or impact.

The cost of porous metal bearings is usually less than that of comparable solid metal bearings.

Frictional characteristics:

The principal characteristic of a porous metal bearing is its ability to retain a lubricant over a period of time. The lubricant is automatically fed to the bearing in limited quantities by capillary attraction.

Starting friction of porous bearings is in general greater than that of solid bearings but, for high speeds or light loads, friction in porous metal bearings is much less than in solid bearings; assuming adequate lubricating in both cases.

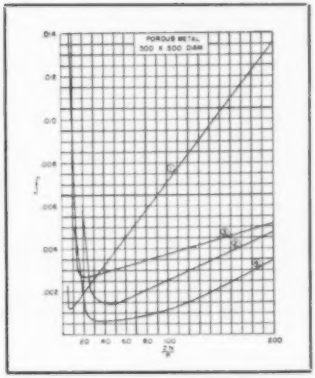
Figure 1 shows comparison of porous metal and solid metal bearings. It will be noticed that the critical area for porous metal occurs at higher ZN/P values than for solid metal bearings. The critical area is considerably greater for the porous metal bearings but the porous metal coefficient of friction does not increase as rapidly with increasing speed and/or decreasing unit pressure. This is apparently due to the fact that the lubricant is present in insufficient quantities to establish a thick oil film. Since porous metal bearings are always operated under conditions of thin-film lubrication, it is suggested that a ZN/P value of 100 be used as compared with 50 for solid bearings.

Design information:

(1) *Selection of Bearing*— All porous bearing materials should be selected on the basis of actual engineering requirements and the material should be subjected to rigid tests before it is approved for use.

(2) *Physical Properties* — (See A.S.T.M. specifications B202-45T)

(3) *Lubricants* — Porous metal bearings do not produce



1. BEARING CHARACTERISTICS are represented on the chart above. Key to the four lines: (1) solid metal bearing; (2) new porous metal bearing; (3) porous bearing after running 100 hours without added lubrication; (4) relubricated porous metal bearing. Drop in friction below that of the new bearing is probably due to surface condition caused by running it.

thick-film lubrication. Therefore, an oil which has a high film strength is required. For general purposes, I.B.M. lubricant No. 8 should be used but its use can be modified consistent with functional requirements. Grease should not be used.

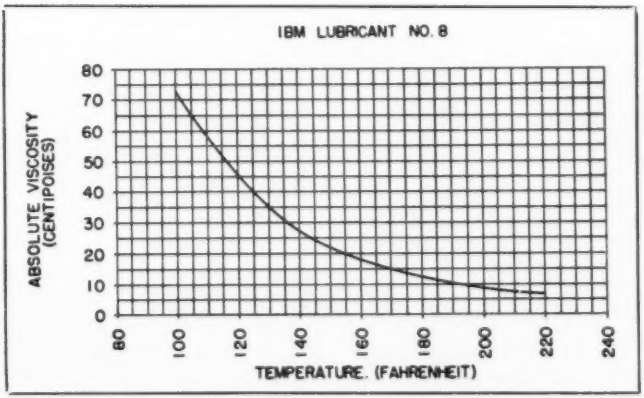
Copper has been found to act as a catalyst upon the oxidation of some oil. This action is intensified at higher temperatures and becomes more important in a porous bronze bearing because of the extensive surface contact provided by the capillaries. Therefore, an oil with high resistance to oxidation is needed, particularly where the bearing is not supplied with fresh lubricant in service.

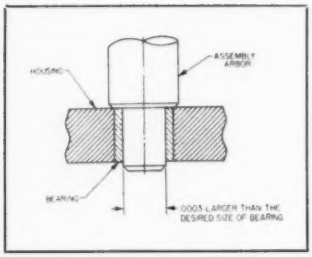
The absolute viscosity values for I.B.M. No. 8 are shown in Figure 2.

(4) *Calculation of Bearing Area*—Bearing area is expressed as projected area (length x diameter of the bearing). Porous metal bearings have a porosity of approximately 20 percent which reduces the active projected area.

In general, for I.B.M. solid bearing design, a ZN/P (viscosity x speed/pressure) value of

2. AN OIL WITH HIGH FILM STRENGTH is recommended for use with porous metal bearings. Below are shown the absolute viscosity values for the lubricant used by IBM for this purpose.





3. ASSEMBLY ARBOR for pressing in porous metal bushings is included in the specifications.

50 is considered satisfactory. Due to the reduced active bearing area of porous bearings, a ZN/P value of 100 should be used. Manufacturers recommend a PV (load x speed) limitation of 50,000 maximum.

P Pounds per square inch
V Velocity in feet per minute.

A safety factor, F_S, based on operating conditions is recommended as in Table I.

Operating Conditions	F_S
Continuous operation without shock load	2
Frequent starts and stops, or oscillatory motion	4

(5) *Shapes* — Porous metal bearings should, whenever possible, have conventional shapes. Sharp corners, narrow and deep splines, large and abrupt thickness changes, uneven cross sections, screw threads, grooves, and other shapes which cannot be molded, can be added by machining in additional operations.

(6) *Size of Bearings* — The size of a porous metal bearing should be consistent with the bearing requirement. Bearings with thin walls are not recommended because of the limited storage space for lubricant and the low compression strength of their walls. (Ed. note: See M.P.A. specifications for standard bearing sizes and dimensions.)

(7) *Press Fits*—Porous metal bearings have low compression strength and low elastic limit. Therefore, the maximum tightness of a press fit is not obtainable unless the inside diameter is supported during the assembly operation. Figure 3 shows the design and size of the assembly arbor. The graph, Figure 4, indicates the interference recommended for press fits between bearing O.D. and housing diameter.

TABLE I

Safety Factor

The projected area of porous metal bearings can be calculated from the formula.

$$\frac{A}{} \quad \frac{100\ F_S W}{ZN}$$

- A L x D Projected area of bearing in square inches
- F_S Safety factor
- W Total load in pounds
- Z Absolute viscosity in centipoises (See Figure II)
- N Shaft speed in revolutions per minute
- P Unit load, or pressure W/A
- L Length of bearing
- D Diameter of bearing

(8) *Running Fits* — Under light loads, porous metal bearings can be used with slightly less clearance than solid metal bearings under like conditions. The recommended fits are shown in Figure 5.

Component part drawings should allow for insertion of the arbor. Therefore, the finished diameter of the hole should be

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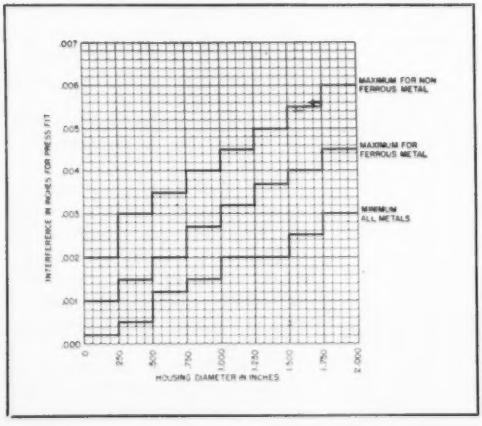
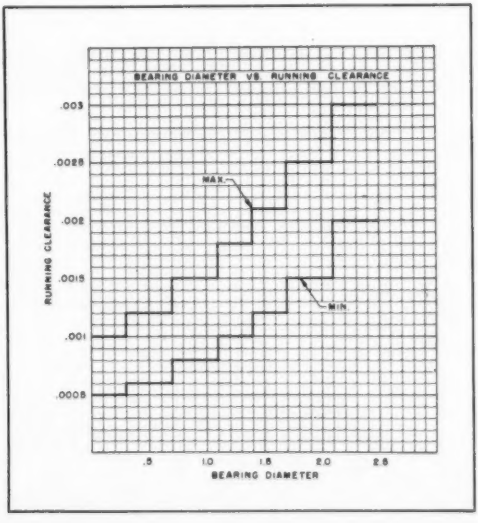
4. INTERFERENCE FITS between OD of bushing and ID of hole in housing are indicated below.

5. RUNNING FITS with light loads are indicated in the chart, right.





How chromium-plated aluminum PERMANENT MOLD CASTINGS replace melamine

WHERE exposure to heat is a condition of service, Majestic Manufacturing Company of St. Louis has replaced melamine handle brackets with aluminum permanent mold castings on the oven of their coal-electric combination cooking range.

These combination ranges are designed to fill a need in farm kitchens where the range not only serves for year-around cooking, but also provides a source of room heat in the winter. Thus, the oven on this model can be heated by electricity-only during the summer when minimum heat radiation is desired, but a combination of coal and electricity in the winter also helps to heat the farm kitchen.

Temperatures obtained with coal sometimes far exceed those possible with electricity and it is this excessive heat that affected the melamine handle posts on the oven door.

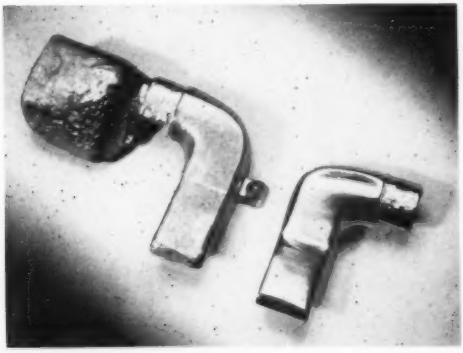
For this specific application, Majestic has turned to chromium plated, aluminum permanent mold handle brackets, that are capable of withstanding the heat.

Aluminum permanent mold castings have been selected in preference to cast iron, not only because of the better as-cast surface of the permanent mold pieces, but also because of the weight difference. The use of the heavier cast iron would affect the carefully calculated balance established for the oven door, planned for the weight of light melamine plastics. To introduce cast iron would have required redesign of the door for proper balance.

Permanent mold castings were chosen over die castings, which would perform the same function with complete satisfaction, even though unit costs would be about the same. The considerable difference in original tool cost caused Majestic to use the permanent mold castings. Since only the oven handle on one model of range is involved, the quantities were not considered great enough to allow die casting die investments.

However, the aluminum permanent mold handle brackets, as completely finished, cost approximately ten times as much as the melamine they replace. Almost the entire difference is accounted for in finishing costs. The permanent mold castings are polished, buffed and chromium plated. This is accomplished without undue difficulty by a local contract plating shop

THE EXTRA HEAT FROM COAL makes it necessary to use aluminum in place of molded melamine for handle posts. The permanent mold casting which withstands the heat, and yet is light enough that it doesn't affect balance of the door, is shown here as finished and as cast with the gate still attached.



Non-standard pinions by POWDER METALLURGY meet all specs at lower cost

IF THE pinion gears in the rotary and stroke type counters made by the Durant Mfg. Co. of Milwaukee, Wisc., were a standard eight tooth pinion, there would probably be no incentive to change from extruded stock to some other source of supply.

All pinions, Figure 1, require not only cutting off, but four of the eight teeth have to be reduced in width from 0.182 to 0.123. This required an end milling operation that was costly and did not give as great a uniformity as could be desired.

THE PROBLEM, therefore, became one of finding a fabricating method that would give pinions of the desired uniformity at the same or lower cost.

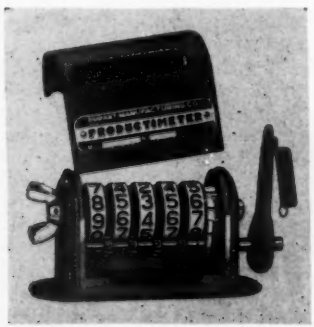
For some applications, an extruded brass pinion was used, for others either a soft steel pinion that was copper plated or a hardened steel pinion either zinc or cadmium plated was in current use.

Going, as they do, into all sorts of applications, the counters have to withstand a wide variety of atmospheric conditions. High relative humidity at high temperatures, exposure to acetic acid and to lactic acid are only a few of the corrosive conditions the new pinions have to meet.

Certain dimensional requirements are sufficiently strict so that a precision fabricating process was essential. For example, the bore ID and pitch diameter had to be concentric within 0.003; the overall OD and the pitch diameter tolerances are ±0.000-0.002; and the ID of the bore is held to ±0.001-0.000.

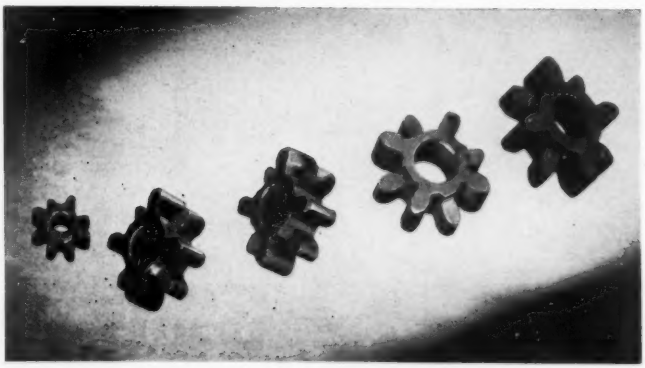
THE SOLUTION was found in powder metallurgy. Now, one pinion made from iron powder, hardened and then Parkerized replaces all three of the pinions mentioned above. The dimensional tolerances are being met, the

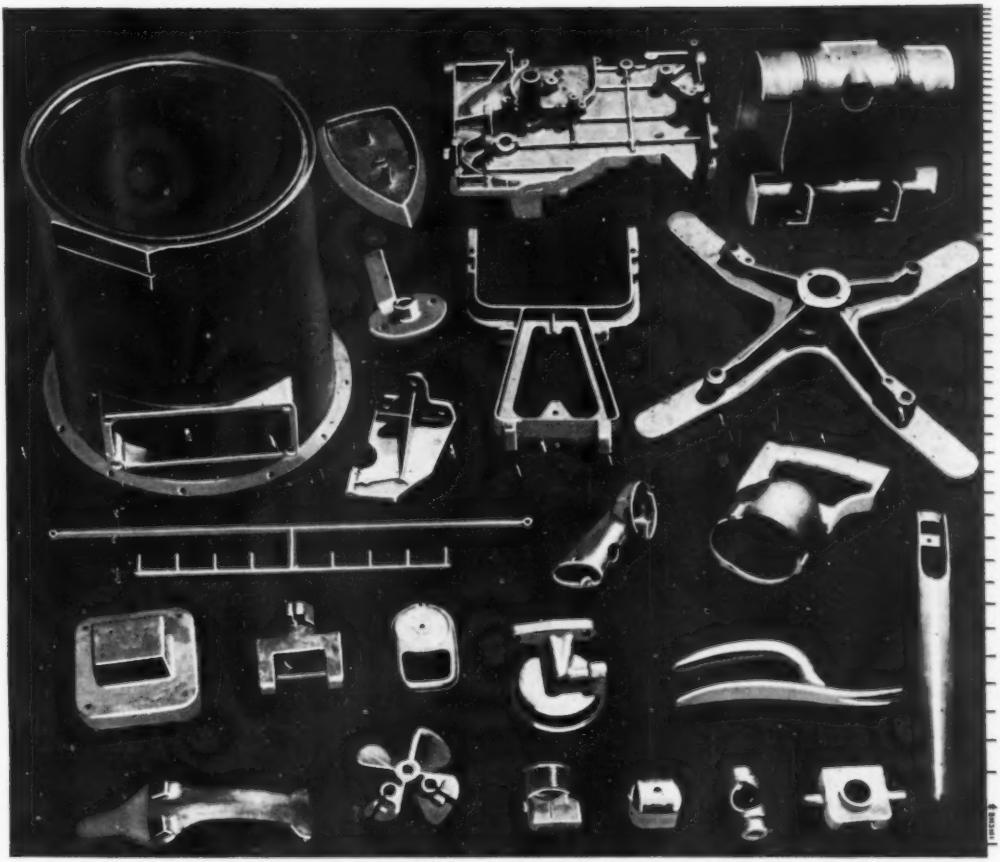
continued on page 86



ASSEMBLED ONTO A SHAFT, the pinions are now ready for operation.

INCREASED WEAR RESISTANCE and lower cost have been achieved by making these counter pinions out of iron powder. The powder pinion (extreme left) replaces hardened steel, brass and copper-plated steel pinions. The small pinion (extreme right) is also of iron powder for a smaller sized counter.





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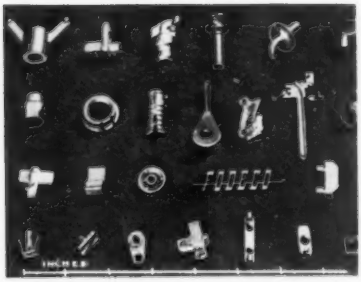
in All Commercial Sizes for War or Peace



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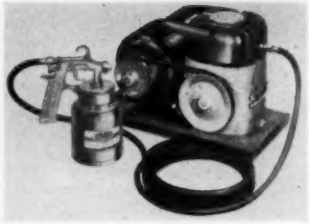
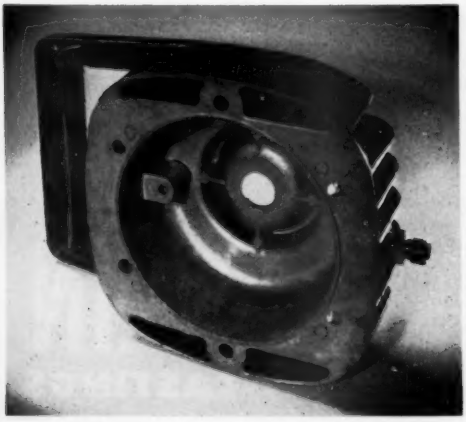


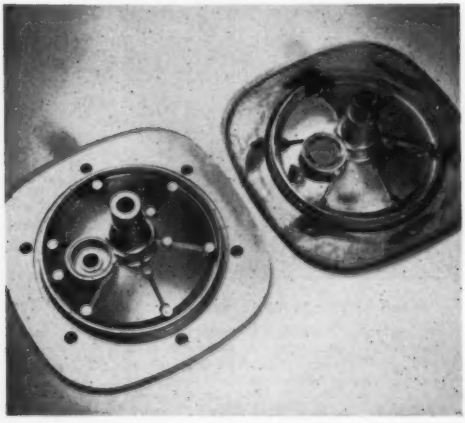
DESIGNED FOR INTERMITTENT SERVICE, the diaphram type air compressor made by the Electric Sprayit Corp., of Sheboygan, Wisc., is another example of sound application of both zinc and aluminum die castings. The pictures tell the story of how finish machining operations have been cut to a minimum by utilizing to the fullest excellent surface finish and the dimensional accuracy that is inherent in die castings. All die castings are produced by Advance Tool & Die Casting Co. of Milwaukee.

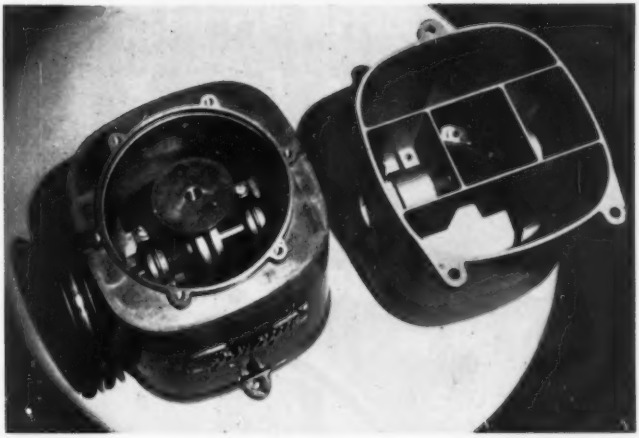
DIE CASTING–quickest way to a complete assembly

COMBINING LIGHT WEIGHT WITH ADEQUATE STRENGTH for moderately stressed parts, this aluminum die casting requires only an end milling and tapping operation for the safety valve and tapping of the air outlet to complete it for assembly. By utilizing an offset handle, good balance is secured when the compressor and motor are mounted as a unit. The relatively high stresses in the handle are adequately distributed by casting the handle as an integral part of the cooling fin structure. Wherever possible, the casting has been cored to save metal and reduce weight. The complexity of this casting would present a severe finishing problem if it were not a die casting. The thin cooling fins preclude any finish (including simple polishing) other than paint or lacquer.

THE DUCTILITY OF ZINC DIE CASTINGS lend themselves admirably to assembly by staking. Use is made of this feature in the valve assembly. The valve ports are cored in the die casting and require only an end milling operation to furnish an adequate seat. A die cast ring is provided on each valve boss so that the retaining cover for the valve assembly can be secured by peening in four places. To provide for gasketing to prevent air leakage, a gasket groove is cast into the top of the valve plate and a ring on the bottom which bears on the diaphragm. For sufficient strength to resist air pressure, the valve plate is dished and ribbed. Internal and external threads on the inlet stem provide for clamping and for a separate air inlet when a filter or other device is required.





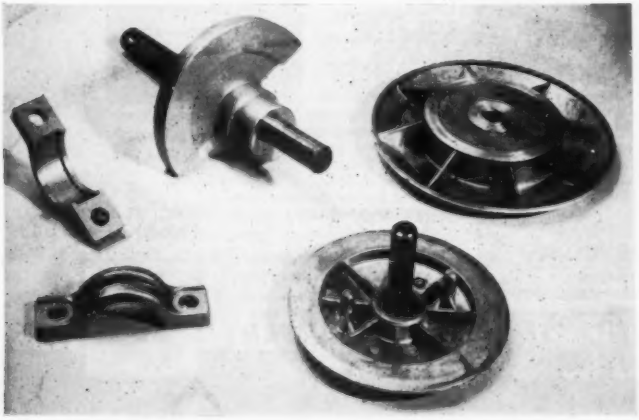


AS A MEANS OF CLAMPING the diaphragm members together and to attach them to the connecting rod, two aluminum die castings are used. These castings, below, are dished and ribbed to provide adequate rigidity. The assembly of castings and diaphragm are held together with a single bolt which also serves to join the connecting rod to the diaphragm assembly.

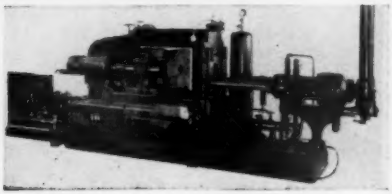
The counterbalance is a zinc die casting which combines this function with the eccentric to give the necessary throw to the connecting rod. The one-half inch drive shaft is cast as an insert in the counterbalance. The eccentric requires a finish machining operation so that a sealed ball bearing can be pressed onto it.

THE BODY CASTING PROVIDES A BASE for the compressor diaphragm section and a mounting for the eccentric drive above. The bearing blocks must be carefully aligned both vertically and horizontally and must have sufficient strength to support the shock loading characteristic of this type of machine. The cross ribbing shown is lightweight, but so placed that it gives all of the support that is necessary. This base section is an excellent example of the use of a multiplicity of cores and slides in a die. The bearing seats, held to normal die casting tolerances, are close enough in alignment so that boring operations are not needed. The only finishing operation is tapping of cored holes.

The connecting rod shown assembled in the body casting is another aluminum die casting and is one of the two parts on the entire assembly that requires a high degree of machining precision. The bore for the connecting rod must be held to ± 0.0001.

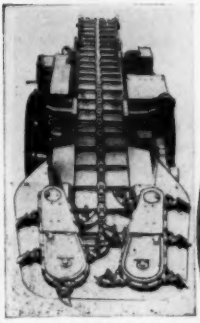


The Filter that Manufacturers Specify—



DIE CASTING MACHINE. **Lester Phoenix, Inc., Cleveland, O.**

DRILLING RIG. **Emsco Derrick & Equipment Co., Los Angeles, California**



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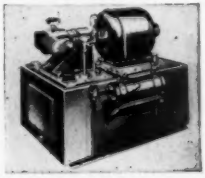
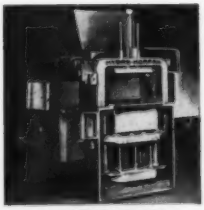


HYDRAULIC PUMPING UNIT

Dennison Equipment Co.
Columbus, Ohio



MASONRY BLOCK
MAKING MACHINE

W. E. Dunn Mfg., Holland, Mich.

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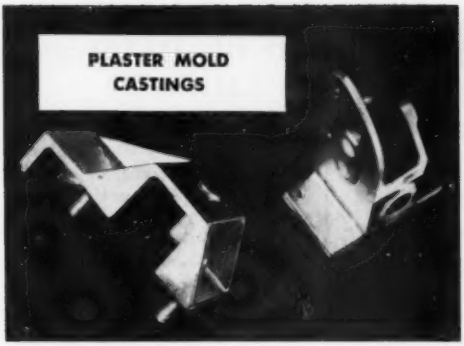


Minimum machining needed on short-run quantities of PLASTER MOLD CASTINGS

THE COMPONENTS

Gear housing and a motor casting for the paper winder on instruments for transmitting hand-written messages or busines forms instantaneously. Produced for the Telautograph Corporation, New York, N. Y., by Ohio Precision Castings, Inc., Dayton, Ohio. Alloy is T-108 aluminum.

PREVIOUS MANUFACTURING METHOD

None. Parts were designed for plaster mold casting.

FINISHING OPERATIONS

Alignment is close enough to require only reaming of holes that have nylon bushings pressed in. Other machining is to drill and tap mounting holes and to tap one large hole in the gear box casting. Base of the gear box casting is surface ground to give the desired flatness.

ADVANTAGES OF PLASTER MOLD CASTING

Low machining costs, since all holes except very small ones are cored. Tolerances held by the caster are as low as ±.002. Quantities are too low for die casting, but equal or superior dimensional control is obtained by plaster mold casting with low initial tooling costs.

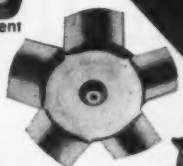
Ferrous Metals Necessary?

"IT AIN'T NECESSARILY SO"

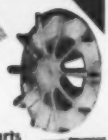
MAGNESIUM and ALUMINUM
DIE CASTING
May Be Your
Solution!

Wire and Textile Spools

Portable Equipment



Automotive Parts



Aircraft Parts

Even though you have relied for years on ferrous metals as the basic materials for the manufacture of parts or products via sand casting, forming, stamping, etc., you can in many cases, die cast these products with the wonderful new lightweight alloys—Magnesium and Aluminum. Indeed, many manufacturers have improved their products through the use of these new metal alloys. They have great tensile strength and offer major reductions where weight is important. Through die casting, much costly labor formerly required for machining and finishing is eliminated. *Illustrated are a few of the products manufactured by Litemetal Dicast, Inc. for varied concerns in the metal consuming industry.*

LITEMETAL DICAST, INC. is an organization of specialists — men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs — little machines for little jobs . . . the right sizes and types of the most modern die casting equipment. Our facilities are complete for producing parts from button size to large cable spools.

Write today for literature and design information. Quick action on inquiries.

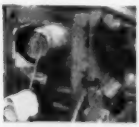
LITEMETAL DICAST Inc.
A DIVISION OF HAYES INDUSTRIES
1925 WILDWOOD AVE · JACKSON, MICHIGAN
PLANT AND EXECUTIVE OFFICES

For additional information Circle No. 48 on the Reader Service Card

Now your die castings clean easier . . . come out free from stains!

keeps castings bright as it lubricates!

BRUSH ON paste-type Mouldlubric 306 for dies casting zinc or aluminum.



SPRAY ON heavy oil Mouldlubric 306L for dies used with zinc or aluminum.

DIE CASTERS welcome the *silvery* color of Mouldlubric 306 as well as its many other benefits. This lubricant makes cleaning easy. Your castings are ready to use if no special finish is specified.

You'll find this pigmented lubricant safely withstands today's high pressure moulding . . . and releases the castings instantly without sticking, scoring or soldering. Your castings will be less porous, more accurate. And your expensive dies will be fully protected.

Get complete information from the Houghton Man or E. F. Houghton & Co., Philadelphia 33, Pa.

MOULDLUBRIC 306 and 306L
. . . products of

E. F. HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

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FINISHING EXPO TO BE HELD IN CHICAGO

Focal point of the metal finishing industry is the Industrial Finishing Exposition being held June 16-20 at International Amphitheater in Chicago under auspices of the American Electroplaters' Society.

The exposition, being held in conjunction with the AES' annual convention, will feature displays of the latest materials, methods and equipment for all phases of finishing. Among the exhibitors of special interest to the readers of PMM are:

Acme Mfg. Co.
Allied Research Products
Almco Div., Queen Stove Wks.
American Buff Corp.
Bart-Messing Corp.
Belke Mfg. Co.
G. S. Blakeslee & Co.
W. H. Brady Co.
Buckeye Products Co.
Buckingham Products Co.
Chemical Corp.
Conforming Matrix, Inc.
Crown Rheostat & Supply
Detrex Corp.
Detroit Chemical Specialties
Diamond Alkali Co.
Distillation Products
Diversey Corp.
Dow Chemical Corp.
Duggan Masking Devices
E. I. DuPont de Nemours
Enthone, Inc.
Formax Mfg. Co.
General Chem. Div., Allied Chemical & Dye
Green Electric Co.
Hanson-Van Winkle-Munning Co.
Hammond Machinery Builders, Inc.
Harshaw Chemical Co.
R. O. Hull & Co.
Imperial Plating Rack Co.
International Nickel Co.
Lasalco, Inc.
Lea Mfg.
MacDermid, Inc.
Matchless Metal Polish Co.
McGean Chemical Co.
Wyandotte Chemicals Corp.
Michigan Buff Co.
J. C. Miller Co.
Minnesota Mining & Mfg. Co.
Mitchell-Bradford Chemical Co.
Munning & Munning, Inc.
Nelson Chemical Corp.
Oakite Products, Inc.
Parker Rust Proof Co.
Phillips Mfg. Co.
Precision Metal Molding
Production Machine Co.
Promat Div, Poor & Co.
Ransburg Electro-Coating
Roto-Finish, Inc.
Schaffner Mfg., Inc.
J. J. Siefen Co.
Standard Electrical Tool Co.
Frederic B. Stevens, Inc.
Turco Products
United Chromium, Inc.
Wagner Brothers

DIRECTORY ADDENDA

The names of several suppliers of components, equipment and raw material were inadvertently omitted from the First PMM Directory of Powder Metallurgy published as a feature of the April 1952 issue. The following additions are submitted, with the suggestion that PMM readers tear out this page and insert it along with the original Directory.

COMPONENT FABRICATORS

JOSEPH DIXON CRUCIBLE CO.
167 Wayne St.
Jersey City, N. J.
(Structural parts of iron, with or without copper, high and medium density; also brass, bronze, copper and nickel silver)

GIBSON ELECTRIC CO.
8350 Frankstown Rd.
Pittsburgh, Pa.
(Contact materials)

INTERNATIONAL POWDER METALLURGY CORP.
Ridgway, Pa.
(Copper and iron base bearings; structural parts of iron and iron copper, medium and high density; also brass and copper parts; electrical components)

LENKURT ELECTRIC CO.
San Carlo, Calif.
(Core materials)

MAGNETIC CORE CORP. OF AMERICA
Ossining, N. Y.
(Core materials)

P. R. MALLORY & CO., INC.
Indianapolis, Ind.
(Contact materials, hevi-metal)

NATIONAL MOLDED PRODUCTS CO.
St. Marys, Pa.
(Copper and iron base bearings; structural parts of iron with and without copper; brass and copper parts all in medium and high density; electrical components)

REESE METAL PRODUCTS CORP.
537 Howard Ave.
Lancaster, Pa.
(Structural parts in iron and copper iron, brass, copper, nickel silver and stainless steel, all in medium and high densities)

EQUIPMENT

SEARGENT & WILBUR, INC.
180 Weeden St.
Pawtucket, R. I.
(Electric furnaces, metal muffle both batch and continuous; dissociated ammonia atmosphere generators)

POWDER SUPPLIERS

VANADIUM ALLOYS STEEL CO.
Latrobe, Pa.
(Stainless steel, pre-alloyed steel)

DEPENDABLE
BETTER METHODS
SUPER CAST
DIE CASTINGS
BETTER DIE CASTINGS
SINCE 1919

The meaning of a signature!

Through a quarter of a century of knowing how, the SUPER CAST reputation for Better Methods—Better Die Castings, has been recognized.

Sound engineering, metallurgical knowledge and skilled techniques have achieved and maintained a standard of superior quality.

SUPER CAST has kept faith, always deserving the mark it bears. SUPER CAST means die castings for those who want the best.

A sound, time-tested institution and a sound time-tested product have won confidence and widespread endorsement.

THE SUPERIOR DIE CASTING COMPANY
1001 London Road CLEVELAND 10, OHIO

For additional information Circle No. 33 on the Reader Service Card

PROMOTIONS AND APPOINTMENTS

Elected to newly created vice presidencies of *Aluminum Company of America* are GORDON W. CAMERON, ARTHUR P. HALL and C. F. NAGEL, JR.

GILBERT B. VALENTINE to be branch manager of the newly established Chicago office of *Wagner Brothers, Inc.*

LEONARD B. VISSER to be director of industrial relations for *Aluminum Industries, Inc.* of Cincinnati.

E. S. GILMORE as New England district sales representative of *Clover Mfg. Co.* of Norwalk, Conn.

AUGUST HOFFMAN CO. of Indianapolis, Ind., to be distributor of MD aluminum pastes and powders and gold bronze powders in Central and Southern Indiana for *Metals Disintegrating Co.* of Elizabeth, N. J.

WALTER E. REMMERS to be vice president of the *Alloys Div., Union Carbide and Carbon Corp.*

R. H. KITZMAN, vice president and general manager of the Toledo plants of *Doehler-Jarvis Corp.*, to be general production manager of that organization.

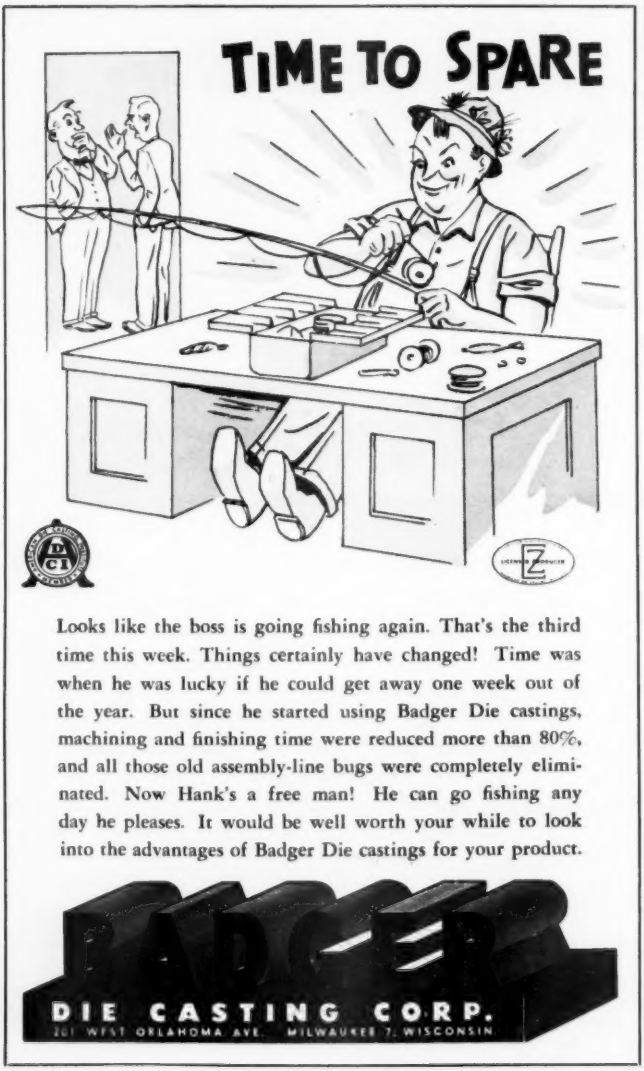
WILLIAM A. CASLER to be manager of program development at *Armour Research Institute* of Illinois Institute of Technology.

ROBERT J. PAINTER to be new treasurer of the *American Society for Testing Materials.*

Four appointments in *General Electric Company's* new Industry Control Department: JOSEPH T. BAILEY, manager of marketing; F. WILEY HUBBELL, manager of finance; WILLIAM F. OSWALT, manager of manufacturing; and H. W. POOLE, manager of engineering.

E. E. ENSIGN, formerly research metallurgist at Ford Motor Co., named vice president of the *A. R. D. Corp.* in New York.

C. W. MARTIN as die sales and service engineer for *Carboloy Department of General Electric Co.* in the company's Pittsburgh office.



Looks like the boss is going fishing again. That's the third time this week. Things certainly have changed! Time was when he was lucky if he could get away one week out of the year. But since he started using Badger Die castings, machining and finishing time were reduced more than 80%, and all those old assembly-line bugs were completely eliminated. Now Hank's a free man! He can go fishing any day he pleases. It would be well worth your while to look into the advantages of Badger Die castings for your product.

For additional information Circle No. 40 on the Reader Service Card

LETTERS TO THE EDITOR
continued from page 6

and are not processed with a decorative finish for sales appeal. Normally, it would be difficult to obtain a satisfactory finish, but by juggling variables—temperature, current density, time and concentration of electrolyte, plus the purchase of a special black dye from Sandoz Chemical Co. of New York, we have been successful in obtaining a uniform appearance for industrial purposes."—Ed.

PMM

Finishing Section

SURFACE FINISHING

Most precision metal molded parts receive some type of surface finish such as plating, organic coating, anodic coating or chemical coating. This section includes information on the methods, processes and equipment used in these surface treatments.

A Section Devoted to Specialized Finishing of

Die Castings • Investment Castings • Powder Metal Parts
Permanent Mold Castings • Plaster Mold Castings

UNICHROME
Trade Mark

News about
COATINGS for METALS
Metallic . . . . . Organic . . . . . Decorative . . . . . Protective

By compensating for nickel with other materials

Chromium Plating Still Gives a Lasting Finish

OUTSTANDING PRIMER FOR ALUMINUM AND MAGNESIUM

In test after test made by outside concerns, Unichrome Primer AP-10 has come through as the one which affords greatest protection to light metals and increases durability of top coats. It adheres through weathering, salt and fresh water immersion without blistering, undercutting or cracking, and is highly recommended by well known producers of aluminum and magnesium for use prior to painting or enameling.

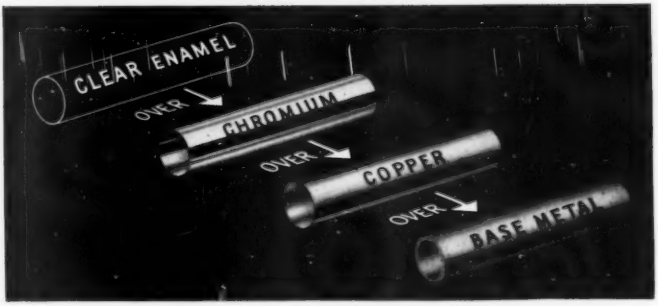
COPPER PLATING PROCESS IMPROVED

The wide current density range at which the Unichrome Pyrophosphate Copper Process plates smooth and fast is maintained over long periods of continuous operation by an improvement in its makeup.

In addition, this process continues to solve other plating plant problems. It can be used in plastic lined tanks formerly used for nickel. It can be plated directly with chromium, with only simple buffing or chemical polishing if needed. It contains no cyanide to dispose of.

ZINC FINISH STAYS BRIGHT AS CHROMIUM

Zinc plate, when chemically treated in Unichrome Clear Dip and then fortified with a Unichrome Clear Enamel, provides a substitute finish which can satisfy exacting requirements. The Clear Dip forms a bright-as-chromium finish integral with the zinc, while the clear enamel adds extra wear and corrosion resistance to this protective finish without detracting from its brightness. This successful finishing system is in widespread use today on zinc die cast and steel products.



Despite scarcities, many products still offer the powerful appeal of a good quality chromium finish. One method for producing such a finish offers substantial advantages. Corrosion resistance is achieved with alternate materials – copper for the undercoat, organic coating for a topcoat. As for the chromium itself, better, faster plating is being obtained with the Unichrome S.R.H.S. Chromium Bath.

PRODUCTION ADVANTAGES WHEREVER USED

Many plants are plating to specifications with Unichrome S.R.H.S. Chromium 20 to 80% faster than with the ordinary chromium bath – and with less trouble. Self-regulating, it minimizes control and maintains top throwing power. With wider bright plate range, it avoids rejects due to "burning" or "missing." Recent reports give some idea of the great improvements this bath has worked on production, costs, and results:

Fishing line guides are plated in 2/3 the time by S.R.H.S. Chromium, and with better coverage and brighter plate. By using this bath, another plant doubled capacity for plating various parts including zinc die castings – and eliminated the former need for special racking. Companies report savings in bath maintenance, too.

A GOOD COPPER UNDERCOAT

Copper plating on zinc die castings and steel contributes to corrosion resistance, and to a brighter finish. Copper deposited from the Unichrome Pyrophosphate bath makes an excellent base for the chromium. If base metal condition and quality requirements permit, it needs no buffing or chemical polishing. If not, it can be easily polished either way.

CLEAR "ENAMELS" COMPLETE THE SYSTEM

Unichrome Clear Coatings were developed especially for use on plated and polished metals. They add extra protection without detracting from brightness.

Baked-on Coating B-115, while virtually invisible, protects against moisture, handling, corrosives, and wear.

For an air dried or force dried finish, Unichrome Coating A-140 provides corrosion-resistance comparable to many coatings that are baked.

Unichrome Coating B-159 also gives outstanding service. A well known manufacturer for instance, is using it on chromium plated refrigerator shelves and is getting not only superior protection but also twice the film thickness at half the cost of the coating formerly used.

An engineer from United Chromium will gladly give full details on this proved system for finishing with chromium. Write or phone.

UNITED CHROMIUM, INCORPORATED
100 East 42nd Street, New York 17, N. Y.
Detroit 20, Mich. • Waterbury 20, Conn.
Chicago 4, Ill. • Los Angeles 13, Calif.
In Canada:
United Chromium Limited, Toronto, Ont.

For additional information circle No. 27 on the Reader Service Card

FINISHING METHODS FOR PRECISION METAL MOLDINGS

- DIE CASTINGS
- INVESTMENT CASTINGS
- PERMANENT MOLD CASTINGS
- PLASTER MOLD CASTINGS
- POWDER METAL PARTS

SUCH inherent qualities as accuracy, complexity, density or controlled porosity — which are likely to be determining reasons for using one of the precision metal molding processes — not only influence the designer in specifying materials but also have an important effect upon the choice of finishing methods.

There are specific ways in which the original fabricating method may influence the choice of surface finishing techniques:

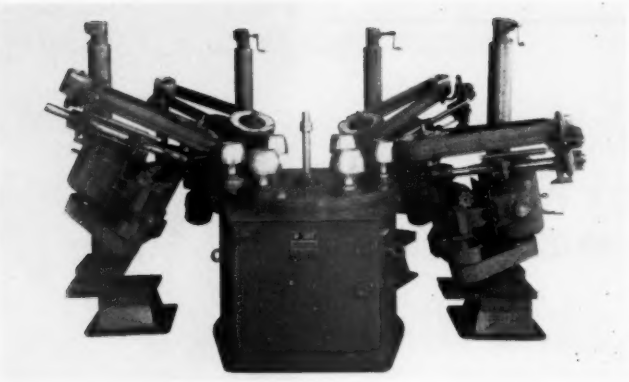
- Die castings always come from the die with a certain amount of flash formed by the die parting, cores and slides. Some peripheral flash can be removed by trim dies, but since one of the most attractive features of die casting is the ability to produce irregular shapes, there are many surfaces which cannot be die-trimmed. The result has been the development of barrel finishing, abrasive blasting, rotary deburring tools, abrasive belts and other special methods of doing the job.

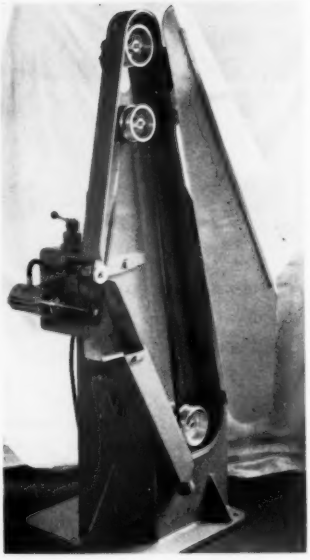
- Investment castings are produced by casting molten metal in a ceramic type casing called an "investment." When the casting has cooled, the investment is broken and removed, but there is always a remnant of investment material clinging to the recesses, undercuts and in the fine surface detail. Obviously, this must be removed, but with as little handling and manual effort as possible. Again, bulk finishing methods have been adapted to the job.

- Powder metal parts, especially those produced from iron powders, may need corrosion protection, but the controlled porosity which is a sought-after characteristic tends to entrap chemical solutions and cause subsequent deterioration. Special treatments have been developed to overcome this problem.

- Most of these processes boast the ability to produce components with a high degree of accuracy, frequently ±.005 as formed, and sometimes closer. Very often, secondary finishes must be applied to such parts without destroying the essential accuracy attained by the forming method. This will, in turn, cause the use of more closely controlled surface finishing methods, and also involves the use of shielding devices to protect critical surfaces during painting, plating or blasting.

The list of examples could be extended, but the above will be enough to illustrate the inter-

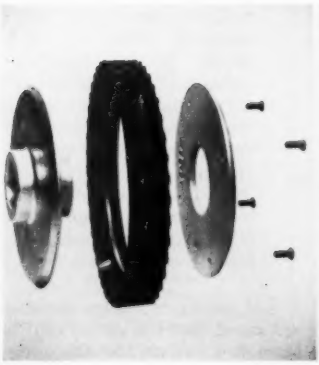




MULTIPLE-STATION automatic or semi-automatic polishing and buffing machines are well adapted to the quantities in which die cast parts are produced. This rotary automatic machine finishes several surfaces on aluminum die castings. Courtesy Acme Manufacturing Co.

FOR JET ENGINE BLADES and buckets, and other small investment castings where cleaning of fillets is an important but difficult job, this pneumatically-tensioned belt grinding and polishing machine is available. Feature of the unit is a high-speed belt over small contact wheel. Courtesy Vonnegut Moulder Corp.

CONTACT WHEELS used in conjunction with abrasive belts, help in finishing contoured non-ferrous castings. Shown below is a new development in contact wheels, consisting of replaceable rubber rim molded onto a steel backing, and mounted in a set of flanges. Different rims can be substituted for different jobs as needed. Courtesy Behr-Manning Corp., Div. Norton Co.



relationship between the original design and the ultimate surface finish. The designer who comprehends the problems of the production engineer and includes the finishing consideration as an integral part of his design function, may very often save time, money and some "impossible" jobs of finishing.

The following review will point out, both for the designer and the production man, those processes which are currently in use for surface finishing of die castings, permanent mold castings, powder metal parts, investment castings and plaster mold castings.

The discussion of each process or material must necessarily be brief due to the large number of processes involved, and the infinite variations in individual problems. It is hoped that enough will be given here to suggest further avenues for the engineer to explore in seeking the best, most efficient and most economical finish for his product. For his convenience, a detailed Reference Library of available literature on page 58 can be used to obtain further information concerning any process.

Abrasive belt finishing

Where used. Die castings, permanent mold castings, investment castings, plaster mold castings.

Type of work. Flash removal, deburring, light machining cuts on difficult contours, rough grinding, preliminary surfacing prior to polishing, buffing and plating.

Advantages. Rapid rate of stock removal; uniform finish resulting from controlled belt speed and uniformity of belt manufacturing techniques; cool operation because the long belt dissipates heat between contacts with the work; low initial investment and low unit cost for abrasive belting; maintenance of close tolerances where needed.

Process. Three principal variations of abrasive belt finish-

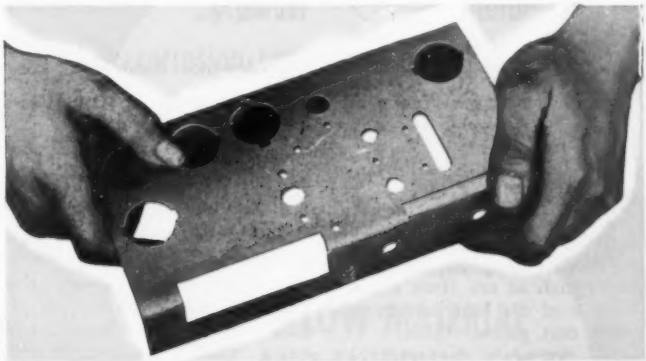
ing are recognized: 1) platen finishing in which the workpiece is ground on a flat portion of the belt behind which is situated a platen to support the belt as the work is pressed against it, 2) contact roll finishing in which the abrasive belt passes around a circular contact roll or pulley which serves to back up the belt at the point of pressure, and 3) free-belt finishing in which no solid back-up of the belt is utilized so that the belt can follow exceptionally irregular contours. These processes may be used either with or without lubricant, that is, either wet belt or dry belt.

Platen grinding with abrasive belt is most useful for such surfaces as flat mating surfaces of die cast housings, gasket surfaces, flash removal where the die parting occurs along a top or bottom edge of a casting. With a wet belt, zinc and aluminum alloys are readily finished and do not tend to load the belt. Close dimensions can be held. Area to be finished can be as great as 30 square inches, but naturally, the greater the area, the lighter should be the amount of stock removal. Fixtures to hold one or more work pieces are practical.

Contact roll grinding is more useful for following contours than for flat surfaces. Flash removal is one of the most important uses of this technique. Improvement in the design of contact rolls during the past few years has resulted in increased belt life, cooler cutting and more accurate control of cutting. Variations in size and hardness of contact wheel will affect rate of cutting, so that the smaller the contact, the faster belt speeds and greater pressures that can be used for more

GREATER BELT LIFE is achieved by means of contact wheel and belt idler when non-ferrous metals are being sanded or polished. An aluminum casting being polished, below, does not load the belt. Courtesy The Carborundum Co.

WIDE VARIETY of small ferrous or non-ferrous parts, such as those shown below, can be finished successfully on abrasive belt machines. Often more than one surface is belt-finished. Courtesy Hammond Machinery Builders, Inc.



COPPER-PLATED PARTS STAY BRIGHT AND CLEAN

When the plating shop treats them with WATER DIP #33

If you are doing your own copper plating or buying copper-plated parts . . .

Then you'll want the full story on a simple, low-cost metal treatment that *keeps* the copper surface bright and chemically clean—just as it comes from the plating bath. *Water Dip #33 prevents finger printing and staining during assembly, storage and use.*

IF YOU'RE DOING COPPER PLATING, you can cut out extra operations by using Water Dip #33. Work goes *directly* from the last hot water rinse into Water Dip #33—no need for rehandling and drying.

IF YOU'RE USING COPPER-PLATED PARTS, you will find that you can make excellent soldered connections, and you can make strong, uniform welds even after the parts have been dipped in Water Dip #33.

Water Dip #33 has many more advantages — in many types of plating. For the complete story, write for Technical Data Bulletin #117 or let our M & W technical consultant discuss your requirements privately with you.

PIONEERS IN PROTECTION

MAAS & WALDSTEIN CO. 438 RIVERSIDE AVE. NEWARK 4, N. J.

Midwest Div.: 1658 Carroll Ave., Chicago 12, Ill. • Pacific Coast Div.: Smith-Davis Co., 10751 Venice Blvd., Los Angeles 34, Cal.

MANUFACTURERS OF INDUSTRIAL FINISHES

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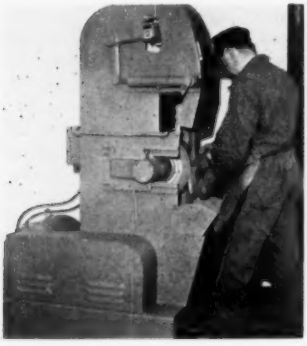
3 WAYS TO FINISH CONTOURS:



1. AN ABRASIVE BELT over a formed contact wheel cleans off parting lines and blends contours. Courtesy Porter-Cable Machine Co.

2. VARIETY OF SURFACES can be obtained by polishing and buffing such as this Lea operation on zinc die casting. Courtesy The Lea Mfg. Co.

3. BRUSH-BACKED POLISHING HEAD consists of resin bonded abrasive strips backed up by brushes. Courtesy Vonnegut Moulder Corp.

rapid cutting action. Serrated type contact wheels recently developed give a cutter-like action to the abrasive grains on the belt, thereby improving stock removal and preventing loading.

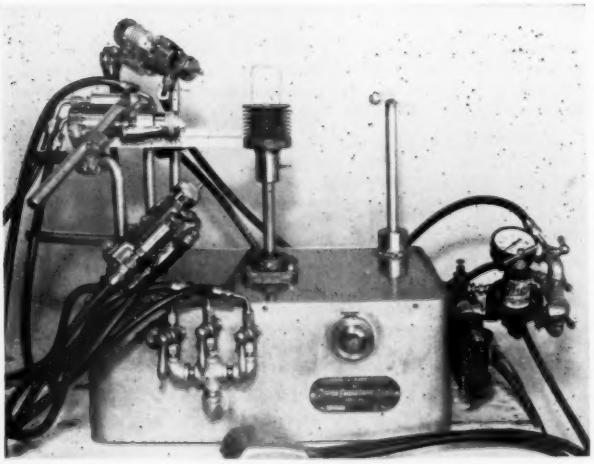
Free belt grinding is particularly useful with narrow belts for touching up irregular contours such as are often characteristic of die cast and investment cast pieces. Often

Abrasive blast finishing

Where used. Die castings, permanent mold castings, investment castings, plsater mold casting.

Type of work. Removal of flash formed by cores, slides and die partings except along periphery; production of satin matte surface; cleaning and production of a "tooth" for mechanical bonding of paint; bulk surface conditioning; removal of plaster mold or investment from surfaces of castings; "shot peening" for improvement of surface density and hardness.

Advantages. Rapid, all-over surface finishing without fixtures or individual setup; elimination of considerable manual snagging and filing on irregular surfaces that cannot be die trimmed for light flash removal



Painting Die Cast Condensers Automatically

THREE AUTOMATIC SPRAY GUNS and a rotating shaft with work holder paint the entire outside surface of this die cast condenser except for two tapped holes on the top. One primer and two finish coats are sprayed. The operator inserts wire-bridged plugs in the tapped holes and puts piece in work holder which is powered by an air motor. Machine spins, paints and stops automatically. Time cycle and rotation speed are adjustable. Gun angles can also be adjusted for other pieces. Courtesy Finish Engineering Co., Inc.

(not suitable for heavy flash); production of a good base for paint adhesion; production of a low-cost decorative treatment, especially for aluminum die castings and permanent mold castings.

Process. Fine mesh abrasive material is blasted at the surface to be finished. Abrasive can be applied or suspended in water. The latter permits the use of finer particles which would otherwise be ineffective as dust particles without a liquid suspension. Various types of abrasive cabinets are available, with work presented to the blast either manually or on a rotary turntable or other conveyor. By adjusting the air pressure ,type and fineness of abrasive, length of exposure to the blast ,and the direction of blast nozzles, it is possible to attain various sur-

FINISHING 52 SURFACES on a tiny investment casting is accomplished by means of a liquid abrasive blast unit. This type of surface conditioning and cleaning can be used on almost all types of small, precise castings. Courtesy Pangborn Corp.

LOW COST
IRIDITE
FINISHES

for zinc, cadmium, aluminum and cuprous metals

provide
corrosion resistance
paint base
choice of
appearance

And they are easy to apply! Just a simple chemical dip for only a few seconds produces the coating.

LOW MATERIAL AND SHIPPING COSTS

combine to make Iridite the most economical chromate finish you can buy. Many Iridite chemicals are packed in powder form, thus can be shipped to you in steel pails at freight savings of up to 75%! Pails take less storage space, are easier to handle, eliminate carboys, need not be returned.

WHY NOT TEST IRIDITE ON YOUR PRODUCTS? Write for literature and send samples for free test processing. See "Plating Supplies" in your classified telephone directory or write direct.

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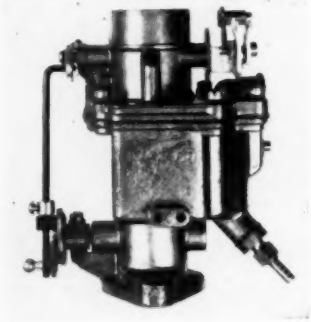
CORROSION RESISTANCE is one of the primary reasons for using chromate type treatments on zinc die castings such as this carburetor housing, which has been given an Iridite coating. Courtesy Allied Research Products, Inc.

BARREL PLATING of aluminum permanent mold and die castings is being accomplished on a production basis with the Alumon process. Several such pieces are shown above. Courtesy Enthone, Inc.



PAINT BASE is another major use for chemical surface treatments on zinc or aluminum die castings. Courtesy Allied Research Products, Inc.

face qualities ranging from a light cleaning to severe working of the surface.

It is possible to control surface dimensions very accurately, sometimes as close as .001 with wet blast employing superfine abrasive materials.

Combination of abrasive blast with tumbling barrel is also useful for bulk finishing of small, irregularly-shaped parts.

Barrel finishing

Where used. Die castings, permanent mold castings (small), powder metal parts, investment castings, plaster mold castings.

Type of work. Burnishing, polishing, rough grinding, deburring, flash removal, breaking sharp edges, preparation for plating, reducing surface porosity. Using barrel equipment, it is also practical to apply paint or to do bulk plating with minimum individual handling of pieces. On powder parts, sometimes used for inspection for adequate sintering.

Advantages. This is a bulk process for surface finishing large quantities of small to medium sized parts of more or less complex shape without skilled labor; wide range of surfaces from high lustre to satin matte can be attained; unit cost of finishing is low; large volume of small parts can be processed simultaneously by a single operator controlling as many as six barrels; process is adapted to ferrous or non-ferrous parts.

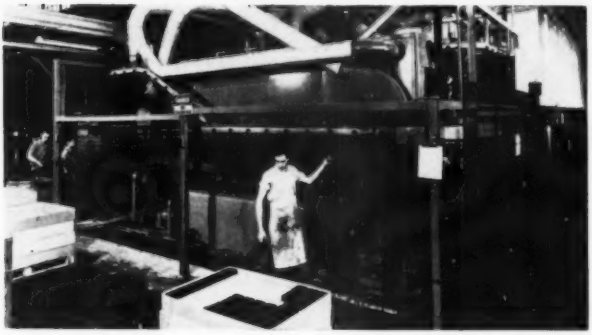
Process. Either open end, tilting barrels, or closed end, horizontal barrels can be used, each providing distinctive movement within the barrel as it rotates.

The unlimited variation in barrel additions is too great to review in detail here* but most commonly, the load consists of an abrasive material; media such as stones, wooden pegs or other carrier for the abrasive; and water. For burnishing, barrel loads may consist of steel balls or metal shapes. Self-tumbling is sometimes practiced, with the work pieces impinging against each other.

In the process of rotating in the barrel with a carefully selected load of processing ma-

*For a full report on materials, methods and equipment for barrel finishing, including a directory of suppliers, see DIE CASTINGS magazine, May 1951, pg. 39.

DIE CASTINGS AND PERMANENT MOLD CASTINGS CAN BE PAINTED . . . . .



on a continuous conveyor . . .

In a compact area 21' x 14', this automatic system at a major automobile plant washes, rinses, dries, paint dips and bakes approximately 1440 generator covers per hour, and is adapted to any small parts finishing operation. Courtesy Cincinnati Cleaning & Finishing Machinery Co., Inc.

or one at a time

Manual paint spraying still is required for a large number of castings having irregular shapes and considerable surface detail. Courtesy The DeVilbiss Co.

terials, the pieces are worked to a finish which can be controlled by varying the speed of rotation, amount of water, number of pieces, kinds of media or abrasives, length of the cycle, etc.

The determination of correct barrel load and cycle of operation is a matter for expert engineering, and the suppliers of barrels and barrel materials have development laboratories equipped and experienced in working out the correct combination for a specific job.

At the end of the barrel cycle, the parts and chips or other process materials, are dumped out and screened to separate the work pieces. These are washed sometimes dried in sawdust or wood chips ,and then are ready for plating, painting, or assembly. The process is frequently used as a means of producing a low cost lustre for inexpensive hardware, plumbing and functional components where finishing costs must be kept down. It is also common as a preliminary method of preparing castings for plating.

Polishing and buffing

Where used. Die castings, permanent mold castings, plaster mold castings, investment castings.

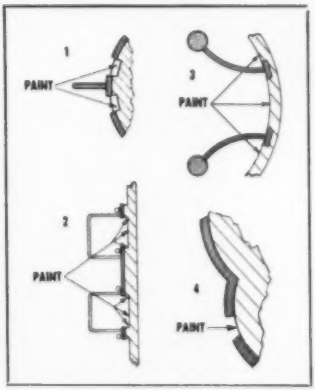
Type of work. Preparing raw castings for subsequent plating or painting; removing parting lines; blending surfaces; eliminating flow marks, foliation or other surface defects; producing a decorative finish on aluminum castings.

Advantages. Complete manual control of the finishing of contours; ability to obtain high quality surface condition needed for plating; handling of parts too large or unbalanced for bulk processing; selective finishing of surfaces.

Process. Polishing and buffing operations are performed with discs of cotton, felt, leather or similar material. For polishing, which accomplishes a heavier cutting action, the discs are sewed and cemented into wheels which are coated with abrasive; for buffing, the discs are sewed together using various patterns of stitching to obtain proper hardness and flexibility to suit the alloy being processed, the shape of the surface and the degree of surface finish required.

The type of fabric or other material used in the wheels, the

Drawings illustrate basic classifications of paint spray masks produced by electroforming. 1) Lip mask for sunken design, 2) Lip mask for capping raised design, 3) Plug mask, 4) Block cut-out plane surface mask. Courtesy Conforming Matrix Corp.



BEFORE AND AFTER BARREL FINISHING . . .

FLASH REMOVAL is a universal problem on die castings. For many smaller die castings, barrel finishing serves both for deflashing and obtaining a controlled degree of polishing or coloring. Courtesy Norton Co.

CLOSE CONTROL of surface finish is possible by adjusting the materials and equipment used in tumbling. Finish from satin matte to high lustre can be obtained. Courtesy Almco Div., Queen Stove Works, Inc.

type of polishing or buffing compound applied, the wheel speeds, pressure of application and method of presenting the work to the wheel will affect the quality of surface obtained. However, certain general practices are common in processing the group of non-ferrous alloys which are die cast or permanent molded. These are principally aluminum and zinc, with minor quantities of megnesium and copper-base alloys.

Polishing, which is a cutting operation, is used principally for removal of heavy flash roots or blending of contours. It is limited in application on zinc die castings which are to be plated because of the nature of the chilled surface of the castings. The densest portion of the casting is the surface, and it is desirable to retain as much of this "skin" as possible in order to avoid opening up microporosity which would, in turn, interfere with plating. Aluminum castings, however, on which the mechanical finishing accomplished by polishing and buffing is often the final surface (as in cooking utensils and hardware items), are frequently polished before buffing.

Buffing is almost universally a part of the cycle for preparing die cast pieces for plating. The best quality "hardware surface" as cast, usually needs some touch-up with a buffing wheel. This may be only a light coloring or wiping to improve the lustre of some area where it has been impossible to achieve the desired "hardware" finish, or it may involve minor flow marks or porosity by a combination of cutting and cold flowing of the soft metal. In general, deep foliation or surface defects cannot be "erased," since the amount of cutting required would open up additional sources of plating trouble. The only recourse, here, is to attempt to improve the casting quality.

Tripoli compositions are the most common ones in use for buffing die castings, and are available in powder, liquid or paste compositions. It has been pointed out, also that since the solutions used for cleaning die castings prior to plating are alalmost always mild in character, the buffing compound should be of such a nature as to be removable in a mild cleaning bath or spray.

It is usually essential to provide good lubrication for the castings prior to plating are minum die castings. The ability of the buff to retain tripoli or other composition, to avoid fraying or burning, and particularly, to avoid glazing, are essential characteristics required of buffs used on die castings.

Two factors connected with the use of die castings affect the method of polishing and buffing: 1) die castings are almost always produced in large quantities, ranging into the hundreds of thousands or millions of pieces, and 2) the shapes of parts may sometimes be composed of compound curvatures and unusual shapes.

ONE ADVANTAGE of die castings is the ability to obtain complex shapes and accurate surface detail, but these features often make manual polishing & buffing difficult. For the majority of small parts such as these zinc die castings, barrel finishing is rapid, economical and completely satisfactory. Courtesy Roto-Finish Corp.

The first of these factors has resulted in large scale use of the automatic buffing machines which process as many as 2,000 pieces per hour and require only the loading and unloading of fixtures at beginning and end of the cycle. The piece here may be submitted to as many as a dozen or more buffing wheels set at various angles so that the majority of surfaces are processed. It is very often also necessary to include one or two manual operations to catch surfaces which are located where they can't be reached automatically.

The second factor, complex shapes, has been responsible for the extensive use of single and double head buffing lathes with manual operations. Small, intricate shapes cannot usually be handled on a straightline or circular type automatic machine. For this reason, the average shop or plant processing die cast parts requires both the manual and automatic cycles in order to accommodate both classes of parts.

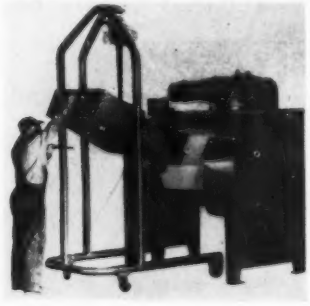
Whether manual or automatic cycle is employed, the process engineer may choose from compositions in stick form, or spray form.

Chemical cleaning

Where used. Die castings, permanent mold castings, investment castings, plaster mold castings.

Type of work. Dirt, grease, oil and buffing compound re-

TYPICAL EQUIPMENT used in barrel finishing is the horizontal, octagonal barrel with auxiliary loading equipment. Complete control equipment and safety devices are built-in. Courtesy Almco Div., Queen Stove Works, Inc.



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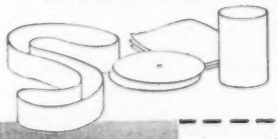

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moval, preparation for plating, painting or other surface treatments.

Advantages. Processes can be altered and selected to meet conditions and achieve desired results. Parts can be made physically and chemically clean without any change of dimension or surface smoothness. Operations can be almost completely automatic. Relatively low investment in time and equipment is more than justified by reduction of rejects during subsequent finishing operations.

Process. Nearly all metal parts receive some type of cleaning treatment before final assembly. Removal of grease and dirt is mandatory in most cases to facilitate handling and inspection. If parts are for delivery to another manufacturer, they must be clean when they are shipped. Most of the cleaning operations performed on permanent mold castings, plaster mold castings, investment castings and powder metal parts fall into this category. However, a large percentage of the die castings and a few of the other precision metal molded parts receive an applied finish, either organic, electroplated or chemical. In these cases, the appearance and adhesion of the finish to the parts depend to a large extent on the cleanliness of the part prior to the application of the finish. For this reason, more exact methods and equipment must be devoted to the cleaning of these parts.

When parts are to be cleaned only for inspection and shipment, the choice of a cleaning method will be dictated by the type of soil to be removed and the amount of equipment by the production rate of the parts. Die castings and permanent mold castings may have traces of die lubricants, and all parts tend to pick up dirt and grease during handling. Solvent or emulsion cleaning, or vapor degreasing will generally be found adequate for this type of cleaning. Emulsion cleaning is probably the cheapest of the three operations and has the advantage of not being corrosive in nature. A power washing machine is usually used with emulsion cleaners ,small batches could be handled by hand scrubbing and soaking in a tank.

You can apply Bellows electrically-controlled Air Power to practically any manually operated machine tool in your shop to (1) feed work to the cutting tool, (2) hold it, (3) feed the cutting tool to and through the work. You can do all three automatically, each movement properly timed, precision controlled.

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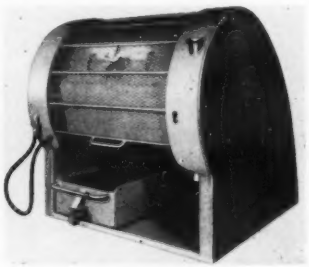
SIZE OF BARREL, number of compartments, type of abrasive material and tumbling media are determined by finish to be obtained, size and shape of workpieces and material being processed. Courtesy Grav-I-Flo Corp.



NOT LIMITED TO SMALL SIZE castings, barrel finishing is also useful for large castings, either tumbled free or racked. Shown here is a group of aluminum die cast pieces which are successfully barrel finished. This is often the entire finishing process required by aluminum pieces. Courtesy Roto-Finish Corp.

Solvent cleaning can be accomplished by soaking in a tank, and therefore requires little outlay for equipment. Washing machines are available which can be used with the solvents generally available. Many solvents, however, are dangerous because of toxicity or low flash points.

Vapor degreasing or spraying has proved very popular in plants with high production rates. In this system, parts are passed through the vapors of heated chlorinated solvents or are sprayed with these solvents, or both. The machine can be tied in with a conveyor system in order to achieve maximum production rates and to minimize hand labor. The cost of the machinery can thus often be offset by increased production. With any of these methods, care must be taken that recessed areas and holes are adequately cleaned.

In case of die castings and other parts which are to receive an applied finish, the above methods are generally used only as preliminary steps to remove heavy deposits of grease, oil or dirt. Proper adhesion of the applied coating demands a chemically clean surface. Some die castings that are to be painted are cleaned in a solution containing an acid that not only cleans the casting but leaves a chromate or phosphate coating to which paints and other organic coatings readily adhere. Most, however, are cleaned in an alkaline solution. This may be done either in a soak tank or a power washing machine.

Electrolytic cleaning employing one of the solutions now on the market perhaps offers the cleanest surface of any available method. Again it should be emphasized that a cleaning method should be selectedd to give satisfactory results at minimum cost, and that no one method is ideal for all situations.

One other problem that may come up if parts are stored before finishing is the formation of rust or scale on ferrous parts

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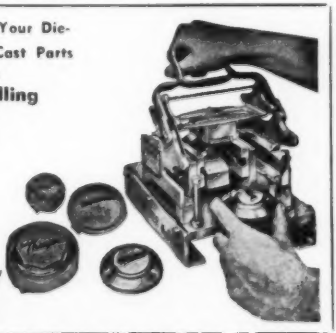

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and of oxide on zinc die castings. Depending upon the type of metal involved, various acid pickling baths can be made up which will remove this scale or oxide. Zinc die castings should be rinsed and plated immediately after this bath to prevent the reformation of the oxide. Literature on all of these cleaning processes, including equipment and supplies, is available from the various manufacturers in the field. It is therefore possible to study these methods thoroughly before selecting any one of them.

Organic finishing

Where used. Die castings, permanent mold castings.

Type of work. Decorative and/or protective coating, substitute for plated finishes, masking of surface defects, product identification, increase or decrease reflectivity.

Advantages. Improved sales appeal of consumer goods; increased ability to withstand exposure; substitute finish acceptable in place of expensive or unavailable coatings; provision of reflective surfaces, as in lighting equipment, or non-reflective surfaces as in optical or photographic equipment; low cost concealment of minor surface defects without buffing; ability to apply coatings on almost any production line with any degree of manual or automatic application desired.

Process. Technological improvements in the quality of coating materials, equipment for application, and auxiliary devices for masking, baking and trimming, have made organic coatings widely used for the finishing of die cast and permanent molded parts. Both of these processes are concerned with large quantities of products, and the ability to provide an attractive surface finish at minimum cost has placed metal parts in a competitive position with regard to molded plastics which possess economical "built-in" color,

continued on page 68

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. . . for strong tapped threads in soft materials

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U.S. Patent 2,449,888

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REFERENCE LIBRARY of current manufacturers' literature available on finishing methods, materials and equipment

ABRASIVE BELTS

Replacement of Set-Up Wheels with Backstand Belt Polishing: **No. 195**
A review of the reasons for changing over from set-up wheels to backstand belt polishing methods is the substance of a brochure from Armour and Co., Coated Abrasives Div.

Advantages of Belt Finishing: **No. 196**
Literature available from Behr-Manning Corp., Div. of Norton Co., goes into the advantages of belt finishing methods, illustrates the company's line of abrasive products, and suggests cost-cutting methods.

Treatise on Coated Abrasives: **No. 197**
In a series of 6 bulletins (No. 25-30) The Carborundum Co. offers considerable technical data on abrasive belts, how they are made, what they do, standard abrasive product shapes, classes of grinding & finishing operations with coated abrasive belts, and a review of coated abrasives for metalworking.

How to Store Coated Abrasives: **No. 198**
The atmospheric & climatic conditions which affect coated abrasives, and methods of storing them for maximum preservation, are surveyed in a brochure from Armour and Co., Coated Abrasives Div. Effects of moisture and temperature, and ways of overcoming adverse effects are included.

ABRASIVE BELT MACHINES

Five Types of Abrasive Belt Machining: **No. 186**
In 32 pages of case history reports, Porter-Cable Machine Co. illustrates the 5 basic types of abrasive belt machining which it diagrams at the beginning: platen, formed wheel, centerless, contact wheel & flexible belt.

Catalog of Abrasive Belt Machines: **No. 187**
Abrasive belt machines manufactured by Porter-Cable Machine Co. are cataloged in a 28-page loose-leaf punched booklet which includes wet and dry belt grinders centerless belt grinders, contour grinding & polishing machines, backstand idlers, bench & utility grinders.

Reprinted Article on Abrasive-Belt Finishing: **No. 188**
An article written by W. A. Papworth, "Abrasive-Belt Finishing," is available in reprint form from Porter-Cable Machine Co.

Data Book on Abrasive Belt Operations: **No. 189**
A 12-page booklet from Murray-Way Corp. gives data on abrasive belt polishing with their Micro-Polish unit, including general information, review of abrasive minerals, machine specs, lubricants, how to select abrasives, etc.

Horizontal & Vertical Surfacing Machines: **No. 190**
For sanding & surfacing die castings, wood, plastics, forgings, etc. on a flat area, Production Machine Co. introduces its Peerless surfacing machines for horizontal or vertical work.

Offhand Contour Grinding: **No. 191**
A machine for contour grinding & finishing irregular shapes by the offhand method using abrasive belts and contact wheels is the subject of a 1-page specification sheet from Production Machine Co.

Backstands to Convert Buffing Lathes to Abrasive Belts: **No. 192**
A method of converting polishing & buffing lathes to the abrasive belt system by use of backstands is the subject of a 1-page piece from Production Machine Co.

Catalog of Abrasive Belt Machines: **No. 193**
A booklet published by Production Machine Co. with the title, "The Production Story," contains a catalog of the company's centerless polishing & finishing machinery.

Abrasive Belt Machine for Jet Engine Blades: **No. 194**
A specially-designed, pneumatically tensioned belt grinding & polishing machine developed for cleanup operations prior to polishing all types of jet engine blades has been announced by Vonnegut Moulder Corp. Feature of the machine described in Bulletin No. 65 is a high speed belt over a relatively small contact wheel, useful for cleaning straight or curved fillets on a wide variety of precision castings.

ABRASIVE BLASTING

Liquid Blasting for Non-Directional Surface Finish: **No. 207**
A form of impact blasting using an abrasive suspended in liquid which is delivered to the blasting nozzle by means of a circulating pump, is the subject of Bulletin 1400A released by The Pangborn Corp. This method gives a non-directional, close-tolerance surface finish especially suitable for finishing precision-type castings, die casting dies, removing surface imperfections from all sorts of ferrous & non-ferrous components.

Blast Cleaning of Castings: **No. 208**
A bulletin from Pangborn Corp. describing their type EN-2 blast cleaning cabinet gives full information concerning the equipment. Cleaning of gates of castings is prominent among types of work accomplished by this equipment.

Blast Cleaning Table: **No. 209**
Types of rotary blast cleaning tables manufactured by The Pangborn Corp. for use with their Rotoblast airless blast cleaning system, are presented in a fully-illustrated 16-page booklet. Also included are individual data and specification sheets on two basic types of Rotoblast cleaning tables.

Nozzles Designed for Pressure Blasting: **No. 210**
A folder from Norton Company introduces the company's Norbide pressure blast nozzles made of boron carbide. Included are instructions for selection and use, diagrams and cross section drawings, charts of fittings and special types of nozzles.

Blasting Cabinets for Small Batch Work: **No. 211**
Catalog 31-A from American Wheelabrator & Equipment Corp. offers the complete line of company's airblast cabinets, small unit-type machines suited for cleaning small lots of work that can be manipulated by hand.

Continuous Airless Blast Cleaning: **No. 212**
Cleaning large volumes of work on a production basis is the special feature of equipment illustrated and described in bulletin 844 "Continuous Airless Blast Cleaning," available from American Wheelabrator & Equipment Corp.

High Velocity Wet Blast Surface Conditioning: **No. 213**
Literature from The Cro-Plate Co. describes their Pressure-Blast wet blasting equipment for high-velocity wet blast surface conditioning and cleaning of metal surfaces. Controlled dimensional control and uniform surface finish are obtained.

BUFFS

Tabulated Data on Pressure-Cooled Buffs: **No. 170**
A folder describing their patented Pressure-Cooled Air-Flow cotton buffs issued by United Buff Products Corp. lists 10 important construction and operating features of the buffs. It also has 2 tabulations of data on buff selection & speeds.

Automatic Centerless Bias Buffs: **No. 171**
Detailed pictorial & descriptive analysis of the preassembled construction of their automatic centerless bias buffs is offered in a booklet from Automatic Buff Co., Div. of American Buff Co.

How to Select Buffs: **No. 172**
A 32-page elaborately bound handbook from American Buff Co. describes a full line of buffs & and also has sections devoted to such topics as buff recommendations for specific purposes, speed chart, how to judge quality of material, etc.

Types of Buffs Compared: **No. 173**
A folder from Formax Mfg. Co. compares 7 basic types of cloth buffs—loose type, full disc, spiral sewed, sun ray, curved tangent, square sewed, parallel sewed & concentric sewed. Gives effective uses for each, plus data on types of cloth & solid polishing wheels.

Buffs for Light-To-Heavy Duty: **No. 174**
Formax Mfg. Co. offers a data sheet on its Zippo Buffs, available in 4 grades for light, standard, heavy & extra heavy duty. These are balanced bias buffs with solid 1-piece steel center construction.

Buff Construction Gives Faster, Smoother Cutting: **No. 175**
Special pleated construction of Finger-Buffs to provide self-air-cooling, better retention of compound and faster cutting is described in a catalog from George R. Churchill Co., Inc. Finger-Buffs are produced in all types of cloth in all sizes.

Pre-Assembled Bias Buffs: **No. 260**
Pre-assembly of buffs setups is made possible by a telescoping flange arrangement developed by Automatic Buff Co., Div. of American Buff Co. The system and its advantages are described in a bulletin offered by the company.

POLISHING, BUFFING, GRINDING MATERIALS

Catalog of Compounds & Cements: **No. 176**
In a 12-page catalog, Formax Mfg. Co. offers its line of polishing, buffing & burring compounds, plus polishing wheel cements. Included are special materials for finishing die casting & other non-ferrous metals.

Abrasive Belt Contact Wheels: **No. 177**
Use of flexible contact wheels with abrasive belt to finish contours is the subject of a leaflet from Formax Mfg. Co. describing their contact wheels & abrasive belt grease sticks.

Composition Catalog with Process Recommendations: **No. 178**
A catalog of buffing & polishing compositions from Frederick B. Stevens, Inc. has process recommendations for a wide range of materials & also gives descriptions of various compositions.

Spray, Bar & Paste Compounds for Polishing and Buffing: **No. 179**
A complete array of finishing materials is cataloged by Schaffner Mfg. Co. including polishing & buffing compounds in spray, bar or paste form, along with buffs & platers' supplies.

POLISHING, BUFFING, GRINDING EQUIPMENT

Straight-Line Automatic Machines: **No. 180**
A variety of straight-line machines for automatic polishing, buffing & grinding is offered by Acme Mfg. Co. Types of machines included are reciprocating type, return type, camming type & many others.

Rotary Automatic Machines: **No. 181**
Many standard & special rotary automatic polishing & buffing machines presented by Acme Mfg. Co. in a 16-page catalog include both wheel & belt types, ranging from single head machines to a 15-ft. continuous rotary buffing machine that finishes upwards of 2,000 die cast handles per hour.

Semi-Automatic Machines: **No. 182**
For low-cost polishing & buffing operations on a variety of parts differing in size, shape, material & type of finish required, Acme Mfg. Co. presents a catalog of semi-automatic polishing & buffing machines.

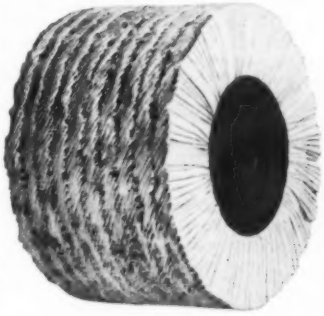
Multi-Position Polishing & Buffing Heads: **No. 183**
Diagrams, photos & descriptions illustrate the 50-series Murray-Way polishing & buffing heads which have full-contact polishing & buffing in all positions on any plane or angle.

Compact Design of Polishing Head: **No. 184**
Their 60-series polishing heads which are of a special, compact design, is illustrated in a folder from Murray-Way Corp.

Variety of Polish, Buff & Grind Setups: **No. 185**
A variety of automatic polishing, buffing & grinding equipment is illustrated by means of 11 different examples in a folder from Murray-Way Corp.

continued on page 60

New "P-30" Churchill FINGER-BUFF*



Produced in all types of cloth in all sizes. Free sample on request.

Pleated Construction and angle of new "P-30" fingers holds compound better and prevents gouging or streaking. The new "P-30" cuts faster.

FINGER-BUFFS Reduce Production Costs

Churchill Finger-Buffs* with high-count, bias-cut cotton cloth and "self-air-cooled" buff fingers, provide longer buff life and greater production capacity.

You will make new savings with Churchill Finger-Buffs* because of their extra-fast cutting-down action. And a real economy when used to remove burrs and rough spots! The tougher your job, the better you'll like your Churchill Finger-Buffs*.

FINGER-BUFFS for every Surface Finish

Construction of the Churchill Finger-Buff* can be regulated to produce the type of finish required on any metal surface. Write us your finish problem.

FINGER-BUFFS for every Buffing Need

There is a Churchill Finger-Buff* for every buffing, polishing and de-burring need. Churchill Finger-Buffs* give you superior performance at lower cost.

Now is the time to make new savings, many ways, with Churchill Finger-Buffs*.

*Trademark reg.

Geo. R. Churchill Co., INC.

North Quincy 71, Mass.

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FREE Catalog

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Please send me FREE catalog and complete information.

• My special buffing problem is .....

Name ..... Title .....

Firm .....

Street .....

City ..... Zone ..... State .....

For additional information Circle No. 52 on the Reader Service Card

Finishing Data for Zinc Die Castings: No. 261
Detailed case histories on the finishing of zinc die castings by the Lea method are available from the Lea Mfg. Co. The case histories show pictures of castings before and after finishing, and give materials and methods used.

Check List for Computing Polishing & Buffing Costs: No. 262
A one-sheet check list prepared by E. Reed Burns Mfg. Corp. makes possible a cost analysis of the polishing or buffing operation, based on 15 items affecting the net cost of operation.

Four Data Sheets on Special Compositions: No. 263
A series of four data sheets on special compositions for polishing, oiling, buffing, cutting and coloring is available from E. Reed Burns Mfg. Co. Included are Burnsrouges, Steelshine, Emerite and Tripolex compositions.

Continuous Automatic Polishing & Buffing: No. 264
High production polishing and buffing to obtain lowest unit finishing costs can be obtained by continuous rotary automatic polishing & buffing machine C-46-40 illustrated and described in literature from Hammond Machinery Builders, Inc.

Instructions on Setting-Up Metal Polishing Wheels: No. 199
In 44 pages of technical information, Norton Company gives instructions on "Setting-Up Metal Polishing Wheels and Belts," including selection of abrasives, selection of glue, preparation of glue, types of wheels, setting up the wheel, importance of correct drying, factors of efficient polishing, and many other topics.

Choice of Polishing Abrasives: No. 200
Complete information on Exolon abrasives for all types of metal polishing jobs is available from The Exolon Company.

Abrasive Grains & Powders: No. 201
Help in selecting the proper grain for each metal finishing job is contained in a booklet, "Abrasive Grain and Powders," issued by The Carborundum Company.

Catalog of Grinding Wheels: No. 202
In a 28-page catalog, Norton Company presents its full line of grinding wheels in 22 types. Wheels and shapes for all sorts of operations, from foundry cut-off to surface grinding are shown.

Series of Bulletins on Grinding: No. 203
In a series of 23 special bulletins, The Carborundum Co. offers technical data on grinding. Bulletins are punched for loose-leaf. Subjects covered include what a grinding wheel does; standard shapes; classes of grinding operations; wheel work & machine movements; stresses due to wheel, work & machine movements; disposal of chips; grinding safety; causes & corrections of common grinding errors; and many others.

Grinding Wheel Manual: No. 204
A grinding wheel manual on snagging, cutting-off and finishing is available from Electro-Refractories & Abrasives Corp., along with a speed calculator.

Wheels for Portable Grinders: No. 205
Vol. 43, No. 3, of "Grits and Grinds," published by Norton Company, has an article on three types of wheels for portable grinders, written by E. T. Larson.

Polishing Heads Have Abrasive Strips Backed by Brush: No. 206
A special type of polishing head in which strips of coated abrasive are backed up by brushes is described in two bulletins from Vonnegut Moulder Corp. Both portable and stationary types of installations are included in the bulletins which are devoted to the unique polishing head construction. By this method, when the workpiece is applied to the polishing head, the brushes yield enough to permit the abrasive to lie into the depressions and "envelope" irregular areas.

BARREL FINISHING

Precision Finishing on Mass Production Basis: No. 230
A new 16-page booklet from Roto-Finish Co. describes and illustrates the process, equipment and materials for barrel finishing large quantities of parts in a precision operation. Six classes of operations which can be done by this process are presented as: grinding, deburring, descaling, polishing, britehoning and coloring. Also included are reprints of several Roto-Finish advertisements discussing various phases of the operation.

Articles on Barrel Finishing Auto Parts: No. 231
Reprints of articles available from Roto-Finish Co. tell about barrel finishing methods used by Chevrolet, Warner Gear Div. of Borg Warner, and Ford, among the automotive builders, and also reprints of articles on Bendix Products Div. of Bendix Aviation and Whirlpool Corp.

What Is Barrel Finishing & How Does It Work? No. 232
A 22-page booklet from Almco Supersheen gives a full description of an advanced barrel finishing technique, and answers questions on Almco's Advanced Barrel Finishing technique.

Barrel Deburring & Finishing Equipment: No. 233
Sizes of barrels for bulk finishing ranging in size from 8" x 16" to 30" x 60" for large or small barrel finishing operations are presented in a complete catalog from Almco Supersheen. Mechanical loading & unloading equipment, separating & storage equipment and other accessories are included.

Abrasive Media & Compounds: No. 234
Specific data on a complete line of barrel finishing abrasive media and compounds is offered in a catalog from Almco Supersheen.

Catalog of Tilting & Horizontal Type Barrels: No. 235
A catalog of finishing barrels is available from Globe Stamping Div. of Hupp Corp. Included are both tilting and horizontal types barrels suitable for finishing a wide variety of metal parts. Full data and specifications are included.

Barrel Finishing Handbook: No. 236
A copy of "3M Barrel Finishing" gives a complete handbook of reference material on barrel finishing of metal parts. Barrel finishing chips, compounds and equipment are offered by the company.

Tumbling Machines and Auxiliary Equipment: No. 237
A series of 1-page reprints are available from The Grav-I-Flo Corp. describing thir line of tumbling barrels, chip separators, and other equipment. Also included in a statement about modern barrel tumbling.

Triple-Action Cutting Barrel: No. 238
A folder from The Hartford Steel Ball Company describes the unique tumbling action obtained in their triple-action cutting barrel developed originally for manufacturing high grade steel balls. Equipment and specs are included.

Guide Book for Barrel Finishing: No. 239
A 56-page guide book on barrel finishing has been published by Norton Company. Editorial material is divided into 3 sections: and is thoroughly illustrated with tumbling procedures and equipment of a large number of barrel manufacturers. Characteristics of the Norton Company's Alundum tumbling abrasive is fully discussed.

Barrel Burnishing Compound: No. 240
A special technical service bulletin from Wyandotte Chemicals Corp. gives data on Burnek 22, a barrel burnishing compound that may be used on aluminum, zinc, steel and stainless steel, as well as brass, copper, nickel, silver & gold. Major portion of the bulletin is devoted to general operating procedure and recommended procedures.

Wet Process & Dry Process Tumbling: No. 241
From Tumb-L-Matic, Inc., are available a series of bulletins giving full information on the company's line of barrel finishing equipment and materials for either wet or dry tumbling. Features and advantages of each type of prosess are discussed.

Barrel Finishing Manual: No. 242
An 18-page Barrel Finishing Manual has been published by Frederick Gumm Chemical Co., Inc., and includes 6 parts in its table of contents: general information, self-rolling parts, deburring with non-metallic medium, deburring with metallic medium, ball burnishing and useful data section.

Catalog of Tumbling Machines & Accessories: No. 243
A complete catalog of their line of tumbling machines and accessory equipment is offered by Crown Rheostat and Supply Co.

Compounds for Barrel Finishing: No. 244
A series of informative bulletins on their barrel finishing compounds have been gathered together into a new catalog by Blue Magic Chemical Specialties Co. Special purpose compounds in concentrated paste and powder forms are for deburring, cleaning, polishing, burnishing and lusterizing nonferrous and ferrous metal castings and stampings.

Use of Bearing Balls for Barrel Finishing: No. 245

A large portion of the new brochure from The Abbott Ball Co. on "Bearing Balls and Burnishing Materials" is devoted to practical barrel finishing. Specific production information relating to barrel speeds, volume of materials, types of additives and recommended shop practice is included.

Macerated Corn Cobs for Barrel Processing: No. 246

A barrel finishing compound consisting of macerated corn cobs of varying fineness is described in literature from Agri-Indus Mfg. Co. called Cocob, the material is used for burnishing or drying and will absorb up to 375% its weight in water.

PAINTING EQUIPMENT & MATERIALS

Clear Lacquer for Most Metals: No. 247

A technical data bulletin from Maas & Waldstein Co. announces Dulac clear, universal lacquer which is reported to have exceptional adhesion to almost all metals including zinc, chromium, cadmium, aluminum, steel, magnesium, copper and many other ferrous & non-ferrous metals. Applied by spray or dip.

Metallic Pigments: No. 248

Information on metallic pigments for industrial finishes can be obtained from Meta's Disintegrating Co., Inc. MD aluminum paste & dry flake powder pigments, or MD gold bronze powders are used to produce metallic finishes.

Paint Baking with Infra-Red: No. 250

A 20-page brochure from Fostoria Pressed Steel Corp. tells about many applications for infra-red heating, including its important application for paint baking. The publication includes diagrams to help in setting up or planning infra-red systems.

Spray Painting Machine with Electroformed Masks: No. 252

A standard spray painting machine from Conforming Matrix Corp. by which electroformed paint spray shields are applied to parts to be painted, is described in a new data sheet. Production rates up to 3,600 per hour are reported.

Electroformed Paint Spray Masks: No. 254

Complicated shapes of die castings that have to be selectively painted can be masked with electroformed paint spray masks, as described and illustrated in a folder from Conforming Matrix Corp. Basic types of masks, methods of application, and some special fixtures, are presented.

Masking Devices for Selective Painting, Plating, Blasting: No. 255

A folder from Duggan Masking Devices shows how electroformed, steel-faced masking devices are being used on die castings, stampings and molded plastic parts for selective painting, plating and blasting.

continued on page 62

ROTO FINISH

Trademark Reg. U.S. Pat. Office

NOW!

put your precision finishing on a mass production basis

SAVE MANHOURS AND MONEY . . . the original Roto-Finish processes completely eliminate hand finishing in most instances. GET ABSOLUTE UNIFORMITY . . . in any quantity. MAINTAIN exact tolerance on precision parts. CUT FINISHING costs as much as 80% . . . this fact has been proved many times in actual installations. LOWER INITIAL AND MAINTENANCE costs . . . you need only one Roto-Finish machine to replace several manual grinding or polishing machines. No exhaust system is ever required.

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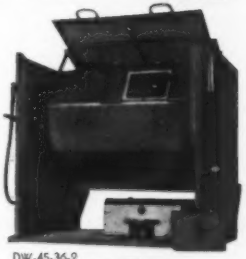

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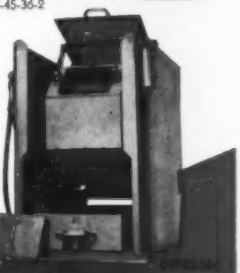

ROTO-FINISH COST-FREE ENGINEERING SERVICE GUARANTEES RESULTS!

Send a few unfinished parts to us . . . plus a finished part for a guide, (or we'll be glad to pick them up from your plant) for a "no charge" demonstration. Then sit back and let us *prove* that Roto-Finish will finish your parts . . . to your specifications . . . and save you time and money. We *guarantee* that you can get the same results in your plant that we produce in our laboratory. *There is no obligation for this service.*

Write for fact-packed Roto-Finish Catalog for complete information.

Roto-Finish COMPANY

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For additional information Circle No. 37 on the Reader Service Card

Article on Electroformed Paint Masks: **No. 256**
A reprint of an article "Electroformed Masks for Production Painting," by Val Jones is offered by Duggan Masking Devices.

Strippable Spray-Booth Coating: **No. 257**
A 1-page report with samples attached tells about Dennis Chemical Company's Red Skin strippable plastic spray booth coatings.

Whirling Enameler Coats Small Parts: **No. 259**
Information is available concerning the Ronci Speedip Whirl Enameler which applies lacquer or enamel to small parts up to 7" in length by submerging basket loads of parts into the coating material and whirling.

Electrostatic Paint Spraying: **No. 260**
Description of the new Ransburg No. 2 process for electrostatic paint spraying has been issued by Ransburg Electro-Coating Corp.

Complete Conveyor Finishing System: **No. 261**
Catalog from The R. C. Mahon Co. describes complete finishing system installations for enamels, lacquer, paint or varnish.

Electroformed Paint Spray Masks: **No. 262**
Paint spray masks that are electroformed to fit the surface of the product exactly are described in literature available from James H. Matthews & Co.

How to Strip Paint from Metal: **No. 263**
A booklet, "How to Strip Paint from Metal Parts," has been released by Oakite Products, Inc.

Spray Booth Compounds & Coatings: **No. 264**
A series of technical data sheets giving information about spray booth maintenance compounds and coatings has been issued in a file-size folder by Klem Chemicals, Inc.

Hot & Cold Paint Strippers: **No. 265**
A reprinted article on paint stripping operations at an appliance plant, plus several data sheets on hot and cold type paint strippers, have been put together in a file-size folder by Klem Chemicals, Inc.

Enamel Strippers: **No. 266**
More than 20 types of enamel strippers are listed in technical literature available from Enthone, Inc.

Spin Dryer for Small Lacquered Parts: **No. 267**
An illustrated 4-page folder from New Holland Machine Co. gives full information concerning machines for spinning dry small lacquered metal parts.

CLEANING MATERIALS

Technical Data File on Metal Cleaners: **No. 214**
A series of 24 technical data sheets on metal cleaners, in a convenient file folder, gives a reference source for metal cleaners manufactured by Cowles Chemical Company. Types of cleaners included are silicated and non-silicated, with and without organic surface active agents, foaming and non-foaming, alkaline and solvent emulsion type, and special strippers.

Fast, Heavy-Duty Cleaning: **No. 215**
Use of a single, rapid-action cleaner for heavy-duty metal cleaning is the subject of a folder, "Heavy Duty Cleaning the Fast Way," issued by Cowles Chemical Company.

Electrocleaner for Zinc Base Die Castings: **No. 216**
A way to control blistering and streaking on zinc base die castings by using Diversey No. 505 electrocleaner & surface conditioner before plating, is explained in a file folder from The Diversey Corp.

Removing Soil from Aluminum: **No. 217**
An aluminum cleaner that cleans thoroughly without leaving white film is described in Bulletin No. 49C from The Diversey Corp. This file folder gives pertinent information concerning Aluminum Cleaner No. 36 which removes soil and marking inks from aluminum.

Removing Oil & Rust in Single Operation: **No. 219**
A type of metal cleaner that removes rust, removes oil, and prepares metal for painting is the subject of a booklet describing compound No. 33 manufactured by Oakite Products, Inc.

Questions on Metal Cleaning Answered: **No. 220**
Some of the most significant questions on metal cleaning are answered in a folder "Some Good Things to Know About Metal Cleaning," published by Oakite Products, Inc.

Picking the Right Electrocleaner: **No. 221**
A 4-point program for picking the right electrocleaner for each type of metal is the subject of literature from Magnus Chemical Co.

Metal Cleaning Technical Bulletins: **No. 222**
A file folder from Klem Chemicals, Inc., contains 3 technical service bulletins on types of cleaners which the company manufacturers for every type of metal surface. These include an Emulsion Concentrate No. 59 which can be diluted with petroleum solvents for spray or soak cleaning; Metal Kleaner No. 159 which is a heavy-duty still & soak tank cleaner; and an electrolytic cleaning process for which 7 different types of cleaning material is offered. Also included is a small folder, "Do You Clean Metal?"

One Solvent for Cleaning All Metals: **No. 223**
A stabilized degreasing solvent called Blacosolv is the subject of literature offered by G. S. Blakeslee & Co. It is reported to be effective for all metals or combinations of metals.

Non-Flammable Metal Degreaser: **No. 224**
A non-flammable degreaser for cleaning grease, oil, waxes, finger marks, moisture, etc. is announced in a piece of literature from Barco Chemical Products Co. The degreaser Q 200 is used cold, is said to dry quickly and is useful for cleaning before anodizing, painting, metallizing or plating.

Chart of Chemical Cleaners: **No. 225**
A selection chart listing phosphoric acid metal cleaners and rust removers manufactured by American Chemical Paint Co. is available from the company. Chart gives information on strengths, temperature limits, operations sequence and required equipment.

CLEANING EQUIPMENT

Handbook on Vapor Degreasing: **No. 226**
A 21-page handbook on vapor degreasing published by Phillips Manufacturing Co., presents questions and answers on technical details of engineered metal cleaning equipment. Forty different questions are answered.

Catalog of Vapor Degreasers: **No. 227**
A catalog from Phillips Manufacturing Company illustrates, describes and gives specifications for a wide range of vapor degreasers. It includes batch type units, combination type degreasers for small parts, tumbling rotary type, conveyor type, and several others.

Machinery for Cleaning & Finishing Metal Parts: **No. 228**
Not only a wide range of cleaning machinery, but also paint spray booths, drying ovens and phosphatizing machines are included in a 24-page catalog from Cincinnati Cleaning & Finishing Machinery Co. Principles of Metal Cleaning are presented. Many of the machines illustrated are suited for cleaning large production of castings such as is characteristic of the automotive or cooking utensil industries. Smaller, cabinet & agitating type machines are also shown.

CHEMICAL TREATMENTS & COATINGS

Corrosion Protection with Chromate Dip: **No. 92**
Data on a chromate dip treatment for protecting die cast zinc products is available from United Chromium, Inc. Process, widely used for such parts as automotive carburetors and fuel pumps, is a corrosion inhibitor and paint base.

Non-Electrolytic Chemical Dip for Protection of Zinc: **No. 93**
Technical bulletin from Allied Research Products, Inc., gives full information on Iridite corrosion protecting dip. This is a non-electrolytic process used on zinc die castings.

Process for Blackening Zinc & Its Alloys: **No. 94**
A leaflet giving operating instructions for the Ebonol "Z" process is offered by Enthone, Inc. This is a process for applying an adherent, jet black inorganic oxide finish to zinc die castings and other types of zinc surfaces as a corrosion inhibitor or paint base.

Cold, Bright Dip for Protecting Zinc: **No. 95**
A utility finish for zinc die castings marketed under the trade name Luster-on Utility by The Chemical Corp., is the subject of several pages of technical data. Specific attention is given to treatment of zinc die castings to obtain uniform surface, corrosion protection, and paint base.

Blackening Process for Ferrous Parts, Including Powdered Metal Parts: **No. 96**
A series of black oxide protective coatings for ferrous parts is the subject of the Black Magic catalog from Mitchell-Bradford Chemical Co. The attractive black finishes provide corrosion protection. One process is adapted for treating powdered iron parts without flowering or bleeding of salts.

Preparing Aluminum Surfaces for Painting: **No. 97**
A brochure with full technical details concerning Aluminprep for preparing aluminum surfaces to get better paint adherence has been offered by Neilson Chemical Co. Can be applied either by dip tank or brush on.

Preparing Zinc Surfaces for Painting: **No. 98**
Information concerning Galvaprep for preparing zinc die castings and other zinc surfaces for painting, is contained in a folder from Neilson Chemical Co.

Cleaning-Phosphating Treatment Combined: **No. 99**
A cleaning & phosphate-coating process for use in mild steel spray-type washing machines is described in literature from Neilson Chemical Co. The company's Prep-n-Cote is designed for increased corrosion resistance and paint adhesion on steel or aluminum.

Blackening of Steel: **No. 100**
Process for obtaining a black oxide finish on steel parts is described in literature from Du-Lite Chemical Corp.

Chart of Phosphating Materials: **No. 101**
A chart on all phosphating chemicals manufactured by Turco Products, Inc., is included in literature available from the company. Six different phosphate chemical treatments are listed together with government specs, metals & coating weights in mg/sf, purpose of coating, method of application, and operating cycle.

Preparing Iron, Steel, Aluminum for Paint: **No. 102**
A bulletin from Kelite describes Poly-Kote which cleans metal surfaces and prepares them for paint adherence in a single operation. Suitable for iron, steel & aluminum.

Phosphate Coating Cycle: **No. 103**
Rust removal and paint preparation are accomplished by a phosphate coating cycle from Klem Chemicals, Inc., described in literature from the company.

Conversion Treatment for Aluminum Surfaces: **No. 104**
A conversion surface treatment for aluminum & its alloys for corrosion resistance & paint bond has been introduced by Silver Star Chemical Co.

Bonderize Phosphate Coating Cycle: **No. 105**
Literature from Parker Rust-Proof, Inc., gives full data on Bonderizing process for phosphate coating of zinc, aluminum or steel surfaces for corrosion protection & paint bond.

Plating Rack Coating Has Longer Life: **No. 108**
A plating rack coating, 218X, that has a longer life and gives better protection than previous coatings manufactured by the company is described in literature offered by United Chromium, Inc.

Acid-Proof Heating Coils: **No. 109**
Heating coils made of tantalum which are said to be immune to all plating and pickling acids except hydrofluoric are shown in literature available from United Chromium, Inc.

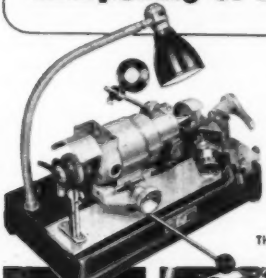
Plating Rack Data: **No. 110**
Pictures and descriptions of methods of manufacturing are included with illustrations of typical plating racks in a booklet offered by the National Rack Co., Inc.

Anodes and Plating Equipment: **No. 111**
Lead anodes of various shapes, lined plating tanks, acid-proof heating equipment and external heating and cooling units are described in Bulletins 92, 46, 42 and 44-A available from the Heil Process Equipment Corp.

Motor-Generators for Plating Power: **No. 112**
A line of motor-generators especially designed to provide power for plating operations is described and illustrated in Bulletin 20-210, offered by the Electric Products Co.

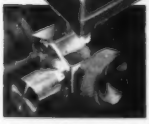
Masking Holes During Plating: **No. 113**
Rubber plugs to protect threaded holes and studs from build-up during plating are described in a data sheet offered be Duggan Masking Devices.

This new DUMORE® grinder eliminates hand sharpening of small drills



This remarkable new grinder sharpens small twist drills with amazing speed and precision. Does away with expensive maintenance of 2-lip drills. No. 70 to ¼". Grinds drill point angles — 90° to 150°, clearance angles 5° to 15°. Reclaims small-size and broken drills. Drills stay sharp longer, last longer.

These features make the Dumore Precision Grinder better



EXCLUSIVE FEED-IN ATTACHMENT—Eliminates breakage and wheel gouging. Allows fine control of finish cuts.

BROKEN DRILL RECLAIMER — Roughing wheel for grinding and reshaping. Drill rest serves as fixture for wheel dresser.

ECONOMICAL WHEEL COST — No expensive shaped wheels. Web-thinning and roughing wheels eliminate frequent wheel dressing.

Ask your industrial distributor for a demonstration, or write

THE DUMORE COMPANY
1317 Seventeenth St., Racine, Wis.

For additional information Circle No. 77 on the Reader Service Card

WHAT'S THE FASTEST WAY TO CLEAN METAL?
See page 11
WHAT'S THE MOST ECONOMICAL WAY?
See page 9
Some good things to know about Metal Cleaning

Oakite's FREE Booklet

"Some good things to know about Metal Cleaning"

answers many questions that mean better production, more profit for you. Just look at the table of contents:

- Tank cleaning methods
- Machine cleaning methods
- Electrocleaning steel
- Electrocleaning nonferrous metals
- Pickling, deoxidizing, bright dipping
- Pre-paint treatment in machines, in tanks and by hand
- Paint-stripping
- Steam-detergent cleaning
- Barrel cleaning
- Burnishing
- Better cleaning in hard-water areas
- Treating water in paint spray booths
- Rust prevention
- Machining and grinding

FREE For this 44-page illustrated booklet, write Oakite Products, Inc., 34 G Rector St., New York 6, N. Y.

Technical Service Representatives in Principal Cities of U. S. & Canada

OAKITE SPECIALIZED INDUSTRIAL CLEANING MATERIALS • METHODS • SERVICE

For additional information Circle No. 78 on the Reader Service Card

For additional information Circle No. 57 on the Reader Sevice Card

Die Castings by FEDERAL

FEDERAL-Built dies and high pressure casting equipment with water hydraulic impact injection assure **GREATER DENSITY and BETTER FINISH.**

MECHANISM FRAME APPROX. SIZE 8" x 9"

New and improved cold chamber casting equipment at FEDERAL now produces larger than average aluminum die castings of superior quality. Consult us before making your decisions!

PRECISION • COMPLEXITY • STRENGTH • ECONOMY

Aluminum and Zinc Alloys.

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FEDERAL DIE CASTING CO.

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PHONE ARMITAGE 6-4803

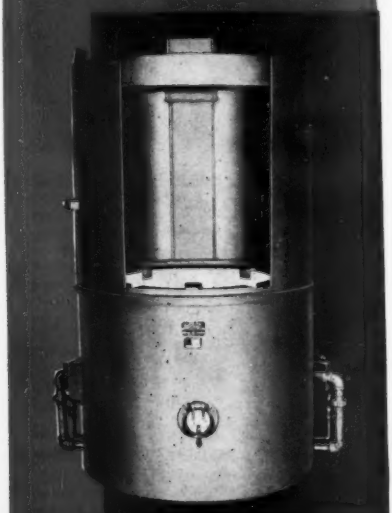
NEW PRESIDENT FOR COWLES CHEMICAL

Robert F. Huntley was elected president of Cowles Chemical Company at the organizational meeting of company directors held recently. Mr. Huntley succeeds Edwin Cowles, who continues as a director.

Mr Huntley came with Cowles in July, 1942, as assistant to the president, after serving as technical director for the Sealright Co., Inc. In September, 1942, he was elected to the board of directors and appointed vice president and general manager. In his new post, Mr. Huntley will continue with the duties of general manager.

The stockholders at their annual meeting earlier in the day reelected Mr. Huntley, Mr. Cowles, C. C. Bassett and C. B. Lansing to the board of directors. David A. Gaskill was elected to succeed E. S. Bassett, who is retiring after serving over 30 years on the board.

ECLIPSE MELTING FURNACES



DESIGNED ESPECIALLY FOR DIE CASTING

Known and respected wherever the melting of tin, lead, zinc, aluminum or magnesium alloy is required, Eclipse Melting Furnaces are favorites in the die casting field.

Furnaces can be furnished with cast iron, steel, chrome coated steel, or alloy iron, depending on the metal to be melted.

Furnace setting is lined with 4½" first quality firebrick and 2½" block insulation. Refractory bottom is tapered toward run out opening.

Gas fired flame retention-type burners with preburned tuyere blocks and continuous burning pilots locate heat at points of maximum heat transfer.

The McKee Low Pressure Proportional Mixer provides proper Air-Gas ratio at all times. The result is high production and low maintenance costs.

All furnaces can be equipped with roll around door type hoods and removable covers for easy accessibility of pot replacement. Write us for Bulletin C-1A.

Representatives in principal cities.

The Eclipse SM-22 Melting Furnace (at left), with a pot size 22½ by 14⅛ inches, has a pot capacity as follows: tin, 1100 lbs.; lead, 1800 lbs.; zinc, 1170 lbs.; aluminum, 440 lbs. Other sizes available, both larger and smaller.

E-317588

Eclipse Fuel Engineering Company

ROCKFORD 1123 BUCHANAN STREET ILLINOIS

McKee Eclipse

For additional information circle No. 43 on the Reader Service Card

PMM USEFUL LITERATURE

For additional information on the products appearing on this and the following pages, mark the key number of the item on the card bound into this issue. Drop the card in the mail—no postage is required.

PROCESSES

Team of Specialists in Investment Casting: No. 144
From Pennsylvania Precision Casting Co. comes a folder introducing its 1-man team of specialists in investment casting, with photograph and biographical sketch of each. Included are ceramics engineer, chief engineer, quality control engineer, chief metallurgist, research director, sales manager and company president. Brief description of company facilities and a location map are included.

A Modern Die Casting Plant: No. 145
In an 8-page folder, Republic Die Casting Company of St. Louis presents a photographic report on company facilities, some of the zinc and aluminum die castings it is producing, and a discussion of the advantages of die castings. Includes photos of three of the company's large hydraulic high pressure die casting machines.

Handbook of Standard Mold Bases & Moldmakers' Supplies: No. 146
An enlarged, fully-illustrated handbook from Detroit Mold Engineering is the company's new catalog of standard mold bases and component parts for molds and dies, along with a complete line of tools and die polishing supplies. This provides a full line of equipment for the die casting die maker.

How to Dimension Engineering Drawings No. 147
In a 40-page illustrated manual, "Practical Dimensioning," by E. C. Helmke, the Gisholt Machine Company presents the fundamentals of dimensioning engineering drawings. Included are 26 drawings with explanatory data.

Porous Castings Made Pressure-tight: No. 148
The main points of its system for making porous castings pressure-tight are outlined in a folder from American Metaseal Corporation. Temperature and chemical resistance are claimed for the vacuum impregnation results. The folder describes the impregnation process, devotes a full page to the properties of the impregnating material. It also describes a pressure bonding process.

MATERIALS & EQUIPMENT

Die Casting Machine Details: No. 152
A number of improvements in the design and construction of their universal, high pressure, hydraulic die casting machines are presented in a new catalog from Cleveland Automatic Machine Co. Complete specifications and detail views of machines for die casting zinc, lead, tin, aluminum, brass and magnesium are included.

Coolant Filtration Equipment: No. 153
In condensed catalog form, a complete line of coolant filtration and oil handling equipment for all machine tools and metal working operations is presented by Honan-Crane Corp.

Spectrographer's News Letter: No. 154
Advance design quantometer is featured in the current issue of "Spectrographer's News Letter" published by Applied Research Laboratories of Glendale, Cal. Vol. V, No. 1, also includes advice on assuring uninterrupted operation of a spectrochemical laboratory.

Cold Solder for Investment Casting Patterns: No. 155
A "cold solder" has been announced by A. L. Okum Company, reported to fill seams and flaws in metal parts, as well as for producing patterns for investment castings. It consists of powdered aluminum in a quick-drying, non-soluble liquid form.

Products, Personnel & Offices of Press Builder: No. 156
A new booklet from Hydraulic Press Mfg. Co. introduces the company products, personnel, office locations, transporation schedules to the company's plant and other general information of interest to customers of this builder of die casting machines and hydraulic presses.

Drill Press Feed: No. 157
Drill press feed having rapid advance, controlled feeding and rapid return, is featured in new bulletin DF110 from The Bellows Company.

Automatic Magnetic Coolant Separator: No. 158
To remove metallic sludge and abrasives from coolant, the Barnes Drill Company has introduced an automatic, magnetic coolant separator in a new 12-page folder illustrating the principle on which it works, its practical application on all types of production equipment, and full specifications.

Heat-Treating Ovens for Low Temperature Work: No. 159
A folder showing applications of ovens for low-temperature heat-treating of ferrous and non-ferrous metals has been issued by Young Brothers Co. Bulletin 14-T illustrates and describes batch and conveyor type ovens with operating temperatures up to 1000 F.

Die Casting Pots of Heat Resisting Iron: No. 160
Melting pots for non-ferrous metals, die casting pots for use on die casting machines, and ingot molds—all made of Acme Special-M-Heat Resisting Iron, are the subject of a leaflet from Acme Foundry Co., Detroit. Full page of dimensions for pot and kettle sizes.

Vertical Profiler & Milling Machine: No. 161
An 8-page illustrated brochure released by Morey Machinery Co., Inc. describes the redesigned Morey No. 12M vertical profiler and milling machine.

Four Die Casting Lubricants: No. 162
Four die casting die lubricants developed expressly to provide clean, accurate castings, longer die life and more economical production are described in a new 4-page illustrated folder entitled, "Houghton's Die Casting Lubricants."

Make Burring a Machine Operation: No. 163
A clearly illustrated folder from Nobur Mfg. Co. shows how to make burring a machine operation with the use of a new type burring tool. Drawings and photos illustrate the way manual burring is eliminated.

Metal Powder Bearing Interchange Sheet: No. 164
Now available for the first time is an Interchange Size Table for metal powder bearings. Compiled and published by the Wel-Met Company, the 4-page folder lists 133 MPA standard self-lubricating bearing sizes, gives inside, outside & length dimensions, and shows corresponding part numbers of interchangeable bearings as produced by Wel-Met and 5 other American manufacturers.

Sequence Drill, Countersink, Tap with 3-Spindle Turret: No. 165
A new 3-spindle turret head which can be attached to any drill press and permits sequence drilling, countersinking & tapping on a single press, has been introduced by Commander Mfg. Co. Literature is available describing the "Select-A-Spindle."

PMM INDUSTRY NEWS

E. H. KLEIN IS NEW HEAD OF M.P.A.

At the Eighth Annual Meeting of the Metal Powder Association held in Chicago, Illinois, April 29-30, 1952 new officers were elected for the forthcoming year:

Ernest H. Klein, manager, Metal Division, New Jersey Zinc Sales Co., New York, was elected president, to succeed Thomas L. Robinson, president of the Wel-Met Co., Kent, Ohio, who was elected chairman of the board.

Newly elected vice-president is Thomas Moore, sales manager, Antara Chemicals Division, General Dyestuff Corp., New York.

George Roberts of the Vanadium-Alloys Steel Company, Latrobe, Pa., was elected to the board of directors. The present members of the board also include Mr. Klein, Richard P. Seelig, vice president, American Electro Corp., Yonkers, N. Y., and William E. Cairnes, president, Radio Cores, Inc., Oak Lawn, Illinois.

The next annual meeting of the Metal Powder Association and the 1953 Metal Powder Show will be held in Cleveland on April 20-22, 1953.

Accurate Die Castings

Mean Lower Finishing and Machining Costs

The above cam action 'loc-tite' die cast handle assembly, as used on CLEARVIEW glass louver blinds, has proven more popular than rachet or gear operators. One easy half radius turn, and the louvers are fully opened or closed. Louvers are locked in any positon by merely pushing in on the handle, and released by the pressure of one finger. It is a definite advantage to the user as many CLEARVIEW customers will testify and we are proud to play our part in its manufacture.

ALUMINUM • ZINC • MAGNESIUM ALLOY DIE CASTINGS

ACCURATE DIE CASTING CO.

3089 E. 80TH ST. • CLEVELAND 4, OHIO

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HARRY SPAET JOINS PRECISION CASTINGS

Harry Spaet has been appointed sales manager for Precision Castings Corp. His office will be located at the new Chicago plant of the company. Mr. Spaet, a mechanical engineer, has been actively identified for the past nine years in die casting engineering and sales in Chicago and the Midwest. For 14 years prior to becoming associated with the die casting industry, Mr. Spaet was employed as a project engineer and in production.

METALS DISINTEGRATING REELECTS PRESIDENT

Reelection of H. E. Hall as its president and treasurer, is announced by Metals Disintegrating Company, Inc., Elizabeth, N. J., manufacturers of metal

pigments, metal powders and metal abrasives.

The officers elected at the annual meeting of the board of directors, also includes: Grover M. Hermann, chairman of the board; Julius F. Sachse, vice president; Mary Sohayda, secretary; Joseph C. Newell, assistant secretary; Paul P. Weber, assistant secretary; James M. Coyle, assistant treasurer.

The directors elected at the annual meeting of stockholders, held the same date, include: H. E. Hall, Harry J. Hemingway, Grover M. Hermann, Edward F. March, Herbert J. Osborne, Theodore Pearson, and Robert E. Pflaumer.

BUY 100% INTEREST IN WEL-MET CO.

R. A. Weaver, chairman of the board of Ferro Corporation, Cleveland, Ohio announces that plans are being completed by Ferro for the purchase of 100 percent interest in the Wel-Met Company of Kent, Ohio and Salem, Indiana. The decision to do this was reached at a meeting of the Board of Directors held on April 7.

Previously, negotiations had been started to acquire a 50 percent interest in Wel-Met Company, manufacturers of powdered metal parts, but finalization of the present action will make Wel-Met a wholly-owned subsidiary of Ferro Corporation.

According to the announcement, there will be no change in present management or sales policies of the Wel-Met Company.

ASTM OFFICIAL DIES

C. Laurence Warwick, executive secretary of the American Society for Testing Materials, and its administrative head since 1919, died suddenly April 23 shortly after presiding at a dinner honoring the retiring treasurer of the Society.

Diaphragm Core for Pneumatic Timing Relays, accurately die-cast of zinc alloy, to extremely close tolerances.

Pneumatic Timing Relay produced by the Square D Company for industrial control applications.

Diaphragm Cores for Pneumatic Timing Relays are Die Cast by MILWAUKEE

Pneumatic timing relays, such as the one pictured here, are used primarily for precision control in industrial applications. Normal variations in voltage, ambient temperature and atmospheric pressure have little or no effect on the accuracy of the time.

A vital component of several Square D pneumatic timing relays is the zinc die-cast diaphragm core which houses the pneumatic control, key to the precision operation of the entire assembly. For example, the tapered hole which accommodates the needle of the valve assembly must be absolutely concentric and in perfect alignment with it at all points, in order to insure accurate functioning of the pneumatic timer. Faithful reproduction of the engineering design, and extremely close dimensional tolerances are other basic requirements.

MILWAUKEE Die Casting Co. is proud of its long association with manufacturers of electrical control equipment as a dependable source of supply for precision die castings. The experience and knowledge acquired in fulfilling their requirements is of great value in the design and production of precision die castings for any purpose.

MILWAUKEE DIE CASTING COMPANY
4146 N. HOLTON STREET · MILWAUKEE 12, WISCONSIN

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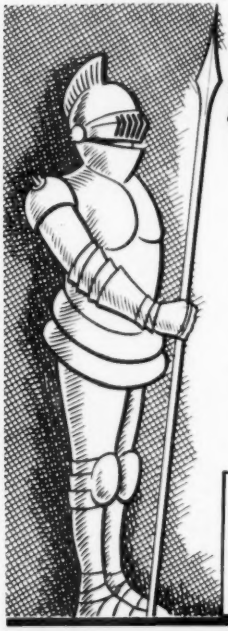
For additional information Circle No. 56 on the Reader Service Card



Fortify Your PRODUCTION WITH Fort CASTINGS

Careful attention to *your* production requirements is a cardinal rule at **Fort** Die Casting Corporation. You are assured of accuracy in meeting *your* specifications, controlled quality of metal and speedy delivery of the finished castings. In addition, **Fort** Engineers will be glad to assist you in adapting your designs to take full advantage of the quality and economy of the die casting process.

Call or write **FORT** *Die Casting Corporation for competent engineering advice on the use of die castings in your production.*

ALUMINUM-ZINC-LEAD CASTINGS

"Certified Analysis Alloys"

FORT DIE CASTING CORP.

MARYSVILLE, MICHIGAN

FINISHING METHODS
continued from page 56

but lack the strength and rigidity of metal.

Standard organic coatings used for other metal parts can usually be applied to die castings, except that the nature of the surface usually requires a chemical or mechanical treatment to overcome what is sometimes described as "greasiness" of the metal and promote adequate paint adhesion. Several paint manufacturers have developed special enamels to give good adhesion on die cast zinc and aluminum.

One of the essentials for satisfactory paint adhesion is thorough cleaning of the metal so that the paint film is fully in contact with the metal surface. Two methods of preparing the surface are chemical and mechanical. Proprietary baths are

Shop foremen say:

"When you need ZAMAK zinc base die casting alloys HENNING can't be beat!"

Ask any man who has worked with our product and he'll give you a dozen reasons in five minutes why he wouldn't use any other. Try it and be convinced.

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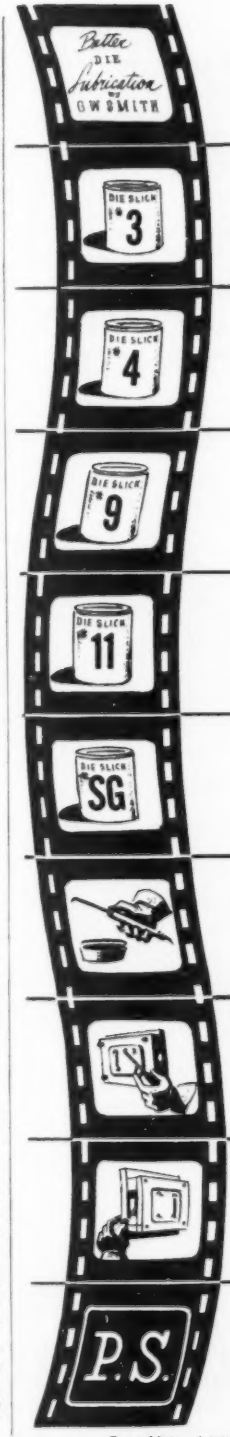
available which provide inert, conversion coatings on zinc or aluminum surfaces. These may be phosphate, chromate or black nickel oxide type coatings which passivate the active metal surface and sometimes provide, in addition, a slight tooth or crystalline structure which gives mechanical bond for the paint. Passivation is important because it reduces the tendency toward interface corrosion which unseats paint. A mechanical method of surface preparation is by abrasive blasting or barrel tumbling to obtain a matte surface. Abrasive blasting also results in a physically clean surface and sometimes eliminates the need for vapor or solvent cleaning which is required as a preliminary for the chemical treatments.

Paints, enamels or lacquers may all be applied to die cast surfaces, and either air dried or baked finishes are in order. However, in almost all cases where conditions of service include any abrasion, exposure to atmospheric attack, exposure to perspiration or other problems, baked finishes give greater durability.

A group of organic coatings which have grown to great popularity as finishes for die castings are the so-called specialty finishes: wrinkle type, hammer type, crackle finishes and others which are applied in a single coat and have enough texture to mask or conceal small surface defects. This dispenses with buffing or polishing. On the other hand, for kitchen appliances, high gloss finishes are usually specified because of the greater ease of cleaning, and in these cases, surface quality of the casting must be equivalent to that needed for chrome plating. High gloss paint emphasizes rather than conceals, small blemishes, and so castings need to be buffed and colored as carefully as for plating. Often, primers are used with gloss enamels, requiring extra baking. This is especially true of



from start

Die Slick No. 3 for difficult ALUMINUM or MAGNESIUM castings. Use full strength where there is trouble. Thin with mineral spirits or kerosene for spraying on dies. Aids parting and ejection, enables better metal flow and better fill-out of casting. Will not stain castings.

Die Slick No. 4 expressly for BRASS castings, sometimes used on aluminum and magnesium. Retains lubricity under high heat . . . used full strength or thinned with mineral spirits or kerosene. Contains lubricating graphite.

Die Slick No. 9 for ultra high "hardware" finish ZINC castings. No. 9 guarantees clean, spotless zinc castings ready to receive plated finishes without necessity of harsh pre-cleaning before the plating operations.

Die Slick No. 11. A general purpose ZINC castings lubricant. No. 11 is a heavy-duty lubricant that satisfies the most severe lubricating requirements for zinc castings. No. 11 is stain free *unless applied too heavily*. May be used full strength or diluted with mineral spirits or kerosene.

Standard Grade Die Slick is used on aluminum and magnesium castings as well as on lead and zinc. It is the general purpose die casting die lubricant for all casting work.

to finish

depend on

DIE SLICK

die casting lubricants

G. W. SMITH & SONS, INC.

5403 Kemp Road, Dayton 4, Ohio
Sole Importer for Great Britain: W. J. Hooker, Ltd.
4 Midland Crescent, Finchley Road, London N. W. 3

don't forget Plunger Slick

Plunger Slick is a specific lubricant for plungers on cold chamber casting machines. P. S. is an adherent, viscous grease that will not break down under heat or friction.

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THE KEY TO YOUR MELTING PROBLEMS

Eliminate guesswork

You can't go wrong with Keystones, because each one is stamped with its identifying S.A.E. number . . . quality assured by custom analysis. Prices comparable to unsheared bar stock. Let our practical metallurgist help you with your problems.

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with your furnace losses included.

Convenient size.
(ferrous — 10 to a lb.)

Send us your specifications.

MELTING KEYSTONES

KEYSTONE LABORATORIES, INC. P.O. Box 628 NORRISTOWN, PA.

ASR asked

Where to get a small handle button, wear-and-water-resistant . . . light enough to be set in plastic . . . produced in large quantities, quickly and inexpensively?

GRC* answered

Tiny GRIES precision zinc die castings will make ideal handle buttons for the new Gem razor . . . meet to a T every ASR specification!

ASR's GEM American Safety Razor's new Feather Weight Gem Razor weighing only 1 1/10 oz.

• WITH GRIES TINY PRECISION ZINC DIE CASTINGS

If obtaining really small parts speedily and economically is your problem, too, why not let GRIES tackle it? Gries' revolutionary, high speed, mass production methods are geared to turn out simple or intricate parts in one operation. Trimmed, ready for use . . . GRIES zinc die castings as small as .000004 of a lb. in lots from 100,000 to millions . . . at a price to help you produce at a profit! Remember . . . it's GRIES for smallness unlimited.

Write TODAY for Bulletin and Actual Part Samples

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MAX. WT. - 1/2 OZ.
MAX. LGTH. - 1 1/4"
SMALLNESS UNLIMITED

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die or permanent mold castings used in the business machine, optical and scientific instrument fields.

Equipment for applying organic coatings include the conventional spray setups, with or without water-wash spray booths. Both manual and automatic spraying is practical, and for a large group of business machine and appliance castings, electrostatic methods are employed whereby the vaporized coating material is attracted to the metal surface electrostatically without overspray.

In the toy trade, die castings are often bulk painted by being tumbled in a barrel with paint and then drained on a screen. One manufacturer of die cast hardware products employs automatic dipping by means of conveyorized racks of castings.

Paint baking equipment used for treating die cast and perma-

DIE CASTINGS

ALUMINUM OR ZINC

☆

C. M. GREY MFG. CO.

QUALITY PRODUCTS SINCE 1910

SEND BLUEPRINTS OR SAMPLES FOR QUOTATIONS

358 CENTRAL AVENUE
EAST ORANGE, N. J.

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AN AUTOMATIC PAINT SPRAY MACHINE in which is incorporated a mask-washing operation as a part of the automatic cycle, paints one or more colors simultaneously at rates up to 3,600 pieces per hour. A series of masks is used in this machine which is especially adapted to the finishing of small die castings. Courtesy Finish Engineering Co.

nent molded pieces include the conventional convection ovens, generally of the batch type, but a trend has grown toward the use of infra-red type units. Either type is practical for processing non-ferrous painted castings.

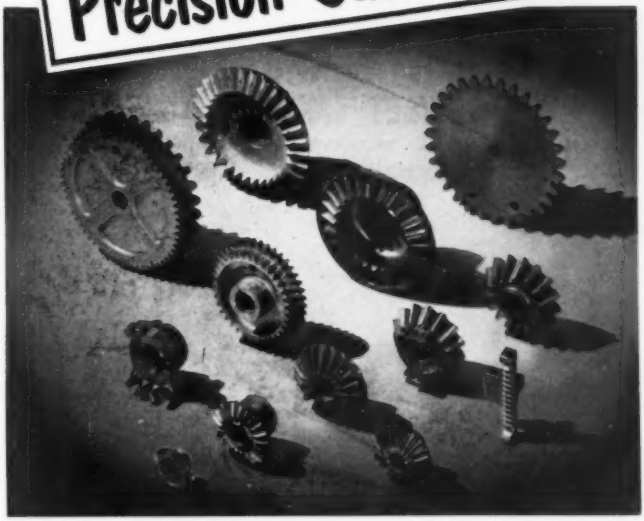
Special masking of die castings is an important advance which has occurred within the past several years. Electroformed and other types of paint spray masks have made possible the selective painting of areas on castings which have very complex shapes, intricate lettering, company trademarks, or curved surfaces. Usually, these masks are made directly over the raw, unpolished castings, and can be made to fit very accurately without allowing bleeding of colors under the edge of the masks

Special jigs and fixtures are built to apply these masks, and at least two companies manufacture special machines for painting parts, using these close-fitting masks. Production rates up to 3600 per hour have been reported, and a recently introduced machine combines the mask washing in the automatic painting cycle.

One feature of die castings is ability to obtain surface detail such as raised or depressed lettering, and devices are available for filling such lettering mechanically. Where this is not practical, the recessed areas are filled with paint, and the raised surfaces then wiped. Dials, nameplates and decorative pieces are give two-color effects this way.

One category of organic coating not mentioned above is the clear-dip, which has become important in recent months as a protective coating over chromium plating. Since the restrictions on nickel plating have

Need Small Precision-Cast Gears?



SPECIFY UNIVERSAL plaster mold precision castings and cut costly machining operations . . . reduce manufacturing costs. Plaster mold gears are sound, clean castings, produced to meet your individual requirements and specified tolerances. Universal has developed the plaster mold process to use aluminum bronze, magnesium bronze and all non-ferrous alloys. Castings made by Universal have unlimited applications in all types of equipment transmitting power and motion. Your particular precision cast problems may be economically solved by plaster mold castings. We invite your inquiries.

You get these outstanding properties when you specify Universal plaster mold castings:

- **High Strength**
- **Fine Detail**
- **Close Tolerance**
- **Non-Corroding**
- **Non-Porous**

Write today for your free copy of illustrated brochure—P-152.

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Precision Castings

"LOST WAX" PROCESS

For those difficult small parts where dimensions are close and shapes complex, our "lost wax" castings in a variety of alloys may solve your problem. Consult with us and use our experience to your advantage.

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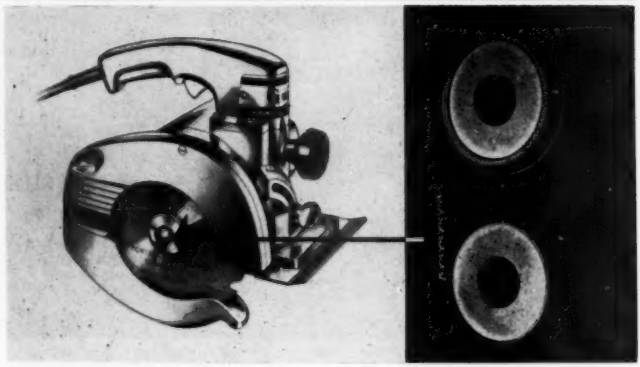
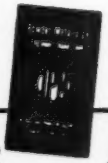


Controlled Friction From Porous Bronze Clutch Discs

makes Porter-Cable Machine Company's new circular saw the safest in the world. To get the exact friction properties they need, Porter-Cable uses a clutch plate produced by International Powder Metallurgy Co. from powdered bronze, impregnated with special lubricant. Perhaps you can get the specific properties your product needs by means of an IPM powdered metal component. Check with us.

The Powder Metallurgy Engineers Handbook is available to you. Send for a copy on your company's letterhead.



International Powder Metallurgy Co.

439 W. MAIN STREET • RIDGWAY, PENNSYLVANIA

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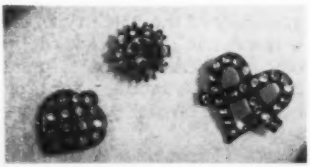
been introduced, and thickness of chromium reduced, the need for protection of the plated surface has brought into prominence the coating of clear enamel or lacquer which increases the durability of the plated surface.

Chemical protective treatments

Where used. Die castings, permanent mold castings, investment castings, plaster mold castings, powder metal parts.

Type of work. Treating the surface of one of the above parts with a solution so as to change the chemical properties of the surface of the part by replacement. No electricity is involved, the change being entirely chemical. Usually accomplished by immersion in tank of solution.



GLOSSY BLACK finish against which rhinestones stand out very well, has been obtained on die cast zinc jewelry by means of Ebonol "Z" process. Courtesy Enthone, Inc.

Purpose can be to provide either a decorative or corrosion-resistant coating, or base for painting.

Advantages. Provides a decorative or chemically inert surface at much lower cost than the electrochemical processes. Very little, if any, change is made in outside dimensions. Some of the processes provide an excellent base for organic coatings. Can be adapted to either large or small production requirements. Simple equipment is required.

Process. A large number of treatments are available for zinc, aluminum magnesium, iron and steel. Most of the treatments are patented and are either used under a license arrangement or are sold under a trade name. Some of them provide a black, gray, olive drab or iridescent color. No attempt will

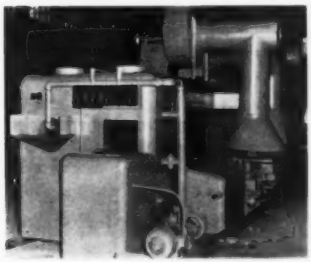
be made to cover individual methods here, since they vary for each of the processes available. In general, they are applied by immersing the parts in a solution which may or may not be heated. It is also necessary to have the parts clean before immersing them to avoid contaminating the solution. After removal from the tank they are dried and are then ready for assembly or subsequent organic coatings.

Plating

Where used. Die castings, permanent mold castings, investment castings, plaster mold castings, powder metal parts.

Type of work. Electrochemical deposition of a metal upon a metal part. Can be decorative or for purposes of wear or corrosion resistance. May be applied as a base for another metal plate.

Advantages. When used decoratively, it can add immeasureably to the sales appeal of an object. Gives long-lasting, smooth and easily cleaned surface. Can have high lustre or can be given a matte, satin or Butler finish. Can be used to cover an inexpensive metal with a costly one, giving the appearance of richness. Can also be used to cover a chemically active metal with a non-corrosive one, or to give a relatively soft metal a hard outer surface.



COMBINATION DRUM AND BELT type washer, together with hot-air blow-off machine, is useful for small parts. This unit is installed at Moraine Products Div., General Motors Corp. Parts are loaded in hopper at left, or on belt at right. Courtesy Cincinnati Cleaning & Finishing Machinery Co.

Process. All metal platings are variations of the same principle. By immersing an object in solution containing a salt of the metal to be plated, and then causing an electric current to flow from the anode to the object, a thin metal coating can be made to adhere to the object.

Plating is a precision job. Too thin a plate will cause cracking and peeling. When the plating is too thick, it may discolor, and will be excessive in cost. Factors influencing the thickness of the plating, among others, are: strength of the solution, current density, time of current application and solution temperature. As mentioned in a previous section of this article, a clean surface prior to plating is a must.

Plating on functional parts for corrosion or wear resistance is accomplished in the same

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manner as that for decorative plating. Among the wear resistant plated metals, the most popular is the hard chrome plate. It is much thicker than decorative chrome plate, and is a dull gray in color. It has been successfully applied to stainless steel investment castings and to aluminum die castings. Corrosion-resisting metals applied as plating include zinc, tin, cadmium, copper and nickel.

Although zinc, tin, copper, brass and nickel are used for decorative plating, by far the most popular metal decorative plate is chromium. Most of the decorative chromium in the precision metal molding field is applied to zinc die castings, and one authority says it is the most popular finish applied to zinc die castings. Although metal shortages have caused variations in the methods used to apply chrome to die cast zinc, the most satisfactory method (when available) is the copper-nickel-chromium method. Chromium plating has also been successfully applied to sintered brass powder parts and die cast aluminum.

In plating aluminum, it is necessary to remove the oxide coating and to keep it from reforming until the plate can be applied. This can be done in a number of ways, among them establishing a conversion coating of zinc, or by abrasive blasting and immersion in the plating tank with the abrasive forming a protective coating which is removed by the plating bath.

The design engineer has a very real influence on the quality of the plating applied to any part. Generally speaking, plating is not easily applied to a large, perfectly flat surface. Such areas should, if possible, be slightly crowned. The designer should also remember that it is difficult to "throw" metal into deep holes and recessed holes. If such cavities cannot be avoided, the plater will be forced to measures which will increase the cost of plating. A wise measure would be for the designer to consult with those responsible for plating before going too far with his design.

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PERMANENT MAGNET PLANT

Construction of an 90,000 square foot permanent magnet manufacturing plant costing, with equipment, over $3,500,000 will get under way in Edmore, Michigan, the first part of May, it has been announced by K. R. Beardslee, general manager, Carboloy Department, General Electric Company.

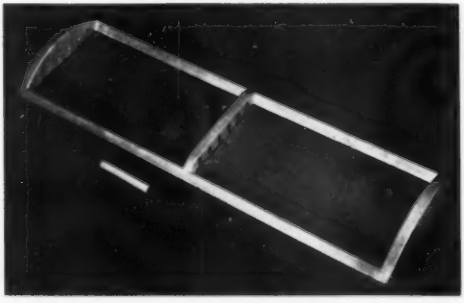
The plant will represent a substantial increase over current manufacturing facilities for Carboloy Department's Alnico permanent magnets. These are currently being produced in Schenectady, N. Y., and are extensively used in all kinds of military and civilian equipment, including radar, radio and television receivers.

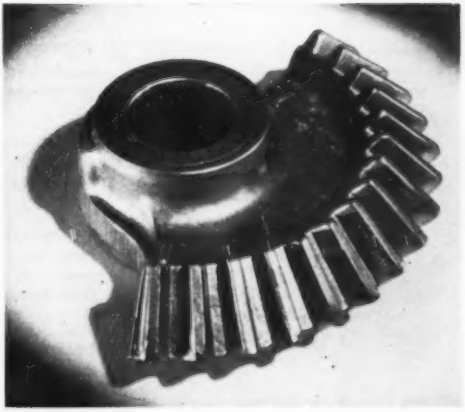
SIMPLIFIED SOLUTIONS

for production problems

NO MACHINING IS NEEDED on this stainless steel cable fitting for aircraft radar equipment which is investment cast to finish dimensions. Crucible Steel Company of America in Harrison, N. J., produces this small piece in stainless type 302, annealed, and most dimensions are held to ±.005, with the exception of a .172 hole which is held to ±.002 as cast. All machining has been eliminated by the investment casting process, making this the least expensive way to produce the fitting.

AS THIN AS A STAMPING but lots more rigid, is this large frame die casting produced in aluminum alloy by Tool-Die Engineering Company of Cleveland, Ohio. Despite the thin wall section, the die caster has been able to get a high quality surface on the casting so that only a light buff is needed prior to painting. In addition to greater rigidity, the die castings also are superior to stamping in two other ways: there is no scrap loss on the die cast frames, and die casting tool costs are lower.





WHERE CURRENT CARRYING PROPERTIES must be combined with high strength, resort is often made to copper base permanent mold castings. The gear segment shown is a part of this sort made by the Mohawk Foundries of Cleveland, Ohio.

For this part, an alloy containing 10 perecent aluminum 1 percent iron and the balance essentially copper is used. In the as-cast condition this alloy has quite high physicals: 65,000 psi ultimate tensile strength, 30,000 psi yield strength, 20 - 35 percent elongation in two inches, and a Brinell hardness of 100 to 140. By heat treatment the tensile strength and hardness can be increased at the expense, of course, of elongation and conductivity.

Dimensional accuracy keynotes the 50 percent reduction in manufacturing cost over a sand casting. The bore is held to ±0.010 on the diameter and to a total indicator reading of 0.010 on concentricity with the OD of the teeth. For the particular use, tooth contour is not critical nor are any other dimensions. The maximum deviation from drawing dimensions is, however, only 0.015.

Finishing operations to ready the casting for use consist only of a boring operation to size the hole and cutting of a keyway. In some cases a set-screw hole is drilled and tapped in the hub.

REFERENCE MATERIAL, catalogs and data offered free in this month's ads (circle numbers on reader service card.)

2. **HANDBOOK ON ALUMINUM** castings describes alloys and production facilities of Aluminum Industries, Inc.

5. **CONSULTATION SERVICE** and complete light metals testing offered by Christiansen Corp. are described in booklet "Quality Increases Sales."

10. **HIGH SPEED DIE CASTING** machines are the subject of literature & spec sheets from Hydraulic Press Mfg. Co.

11. **FULL LINE OF DIE CASTING** machines is presented in a catalog from Kux Machine Co.

12. **DIE CASTING MACHINE** data and specifications are offered by Lake Erie Engineering.

13. **CATALOG ON DIE CASTING** machines from Lester-Phoenix includes specification data.

14. **TWO-CHAMBER INDUCTION** melting furnaces for non-ferrous alloys are described in literature from Lindberg Engineering.

16. **HYDRAULIC OIL FILTERS** produced by Marvel Engineering are presented in a data sheet.

17. **FACTS ON PERMANENT MOLD** and die cast parts are offered in a Fact File from Monarch Aluminum.

23. **PROTECTION FOR HYDRAULIC** fluids from overheating by the use of heat exchangers is the subject of a guidebook from Ross Heater.

26. **CLEANERS FOR METAL** are the subject of several technical data sheets from Cowles Chemical Co.

30. **DIMENSIONING DIE CASTINGS** is the subject of a guide book from Newton-New Haven Co.

35. **BACKSTAND BELT GRINDING** and polishing is the subject of a booklet published by Armour & Co.

36. **IRIDITE FOR PROTECTING METAL** surfaces is described in literature from Allied Research.

37. **BARREL FINISHING** of small metal parts by use of the Roto-Finish process is discussed in literature from Roto-Finish Co.

41. **COMPLETE SPECIFICATIONS** for a line of die casting machines are available from Cast Master, Inc.

43. **MELTING FURNACES** in large and small capacities are illustrated in literature from Eclipse Fuel Engineering.

45. **ZINC ALLOY SUPPLIERS,** Henning Bros. & Smith, offer a monthly house organ of interest to users of alloy.

46. **HOW TO DESIGN** aluminum & magnesium die castings is the subject of a data book from Litemetal Dicast.

49. **PLASTER MOLD CASTINGS** are discussed in a catalog from Universal Castings telling about the process, alloys, physicals & typical parts.

51. **WIRING DIAGRAMS,** case histories and specifications for using air controls on machining operations are offered by The Bellows Co.

52. **SPECIALLY-CONSTRUCTED BUFFS** for faster cutting and better finishing are described in literature from Geo. R. Churchill Co. presenting their Finger-Buffs.

53. **KEEPING COPPER-PLATE BRIGHT** and clean by the use of Water Dip No. 3 bath is the subject of a leaflet from Maas & Waldstein.

54. **DIE CASTINGS FOR DEFENSE** is the subject of a booklet from Advance Tool & Die Casting.

59. **SMALL DIE CASTINGS,** a review of size, alloy & design limits in a folder from Gries Reproducer.

61. **DESIGNING FOR POWDER METALLURGY** is the subject of an engineer's handbook from International Powder Metallurgy.

64. **DATA BOOK ON POROUS BEARINGS** giving full specs on standard bearings that save cost, is offered by National Molded Products.

68. **THREE WAYS TO FINISH ZINC** die castings are suggested in data sheets from Chemical Corp. offering Luster-On which is used as a paint bond, as a final colored finish, or a chrome-like coating over buffed castings.

69. **SCREW THREAD INSERTS** for use in die cast metals are the subject of a data-sheet from Groov-Pin.

72. **NEW ALUMINUM ALLOY** specifications are listed in a brochure from Wm. Jobbins. Alloy is Almag 35.

73. **ROCKING-TYPE ELECTRIC FURNACE** with 60 lb. capacity is the subject of literature from Kuhlman Electric.

74. **REFERENCE FOLDER** on a line of P-V investments for the investment casting process is offered by Pre-Vest.

78. **HOW TO CLEAN METAL** is the subject of a booklet, "Some Good Things to Know About Metal Cleaning," from Oakite.

83. **BARREL FINISHING** methods, materials and equipment are covered in 3 reference books available from Almco Div., Queen Stove Works.

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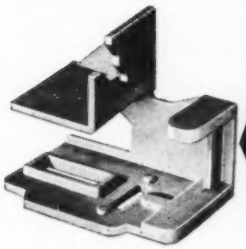

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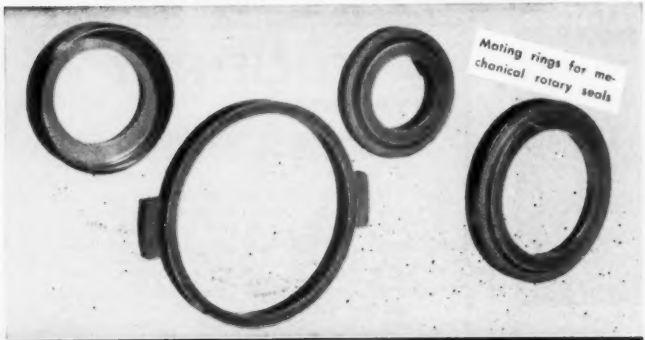

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INTAGLIO LETTERING
continued from page 29

fact that the design and construction of the two-cavity die had been completely finalized and was working smoothly. Owing to the layout of these cavities and the size of die blocks employed it could not be readily and inexpensively adapted to embrace retracting slides, or loose split plates. In any case use of such members would be precluded because of the customer's insistence that alteration charges be kept very low.

Thus the die designer was faced with the unenviable problem of modifying this die in an efficient manner, to a very strict price level.

As will be observed from the diagram Figure 1 the required lettered inscription could only be situated upon the front

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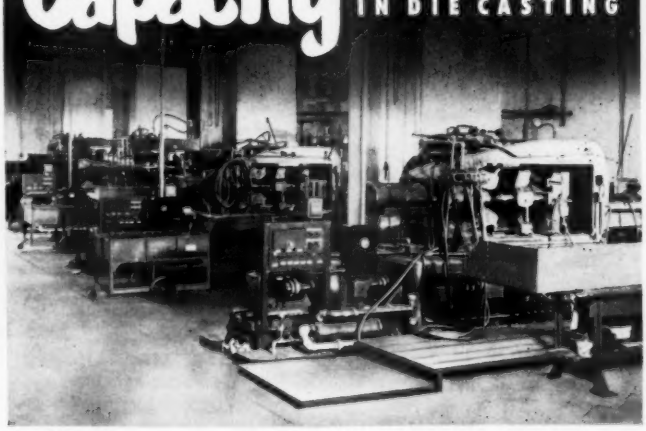

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straight side of the component. It was desired to use a sunken panel background containing raised letter impressions. The depth of panel and height of letters were to be identical, viz .030 relief, in order that the flat tops of the letters would lie level with the surrounding surface of the article.

Introduction of such a panelled inscription was facilitated by the disposition of the main parting-joint surface of the die, which position is indicated on the diagram.

The diagrams, Figure 2, illustrate in partial views, the layout of the modified die, and in particular the interesting, unusual and economical coring principle adopted to produce the panelled lettered impression.

It will be specially noted this modification employs no slides, or loose detachable plates. Instead simple swivelling blocks are used, the actuation of which is automatically derived from the normal opening and closing movements of the die.

The lower diagram is a parting-line view of the stationary die half *A*, which contains two identical cavity formations for reproducing the entire external configuration of the casting. These cavities are disposed with the stepped walls innermost.

A rectangular slot *B* is machined into the parting-line surface in the manner shown. The width of this slot is exactly equal to the overall length of the panel desired on the component. It is located, in each case, in the proper relationship with the overall length of the die cavity. The slot extends fully into the cavity, and the base is stepped deeper after the fashion shown in the upper sectioned diagram. The sides of the slot are perfectly smooth and parallel.

Into each slot is very closely fitted the hardened steel swivelling block *C*, which is substantially L-shape. Each block is pivoted about the shank of the headed steel fulcrum pin *D* situated in a hole drilled vertically

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into the die from its top edge. This pin should be hardened. The projecting portion of the block around this pin should be machined truly radial, and slightly smaller than the half-round base of slot *B* to give proper working clearance.

The upper section diagram shows the two swivelling blocks in the close position in readiness for injection of the molten charge into the cavities. In this position the forward flat portion of each slide should fit very closely against plain surface *E*, to form an effective seal against ingress of metal. With these two surfaces bearing together the top surface of each slide lying at the parting-line *F* should be finished perfectly level, or if preferred .001 above that surface. A minute projection of this scale would then ensure powerful locking of the two blocks when the movable die half is brought to the closed position and clamped to the stationary die.

It will be observed that the outside end of each slot *B* is inclined outwardly a slight amount, while the end face of swivelling block adjacent thereto, is inclined a similar amount, but in the inward direction. This is necessary to allow clearance for the block when swivelled, the same inclined faces acting as positive stops to arrest the swivelling movement of the blocks beyond a certain point.

The innermost side *G* of each swivelling block *C* projects into the cavity area for .030, and the surface is engraved with the necessary letters, in intaglio form.

The swivelling block shape at this point therefore forms the sunken panel, and the task of engraving these members was considerably simplified owing to their being easily extracted from the die and set-up in such a manner on the engraving machine to give complete access when sinking the letter impressions.

The middle section view illustrates the formation of the movable die member which carries the coring projections, dowels

and ejector-rod mechanism after the usual fashion.

These illustrations indicate the simpler manner in which the die mechanism operates. The two swivelling blocks *C* will be brought to the closed casting position, as shown in the upper view, when the movable die half moves forward to seal up on the parting-line joint *F*. This will cause the two blocks to bear tightly against surfaces *E*.

After injection of the charge, and solidification of the twin castings has occurred, the die is opened in the normal way for ejection.

As the movable die half retracts, the castings adhering to the projecting cores thereon, will be brought out of the cavities in the stationary die, after the manner depicted at Figure 3. This forward movement of the die member and the cast components will automatically cause the two swivelling blocks *C* to swivel forward. Since the center of the fulcrum pin hole *D* is located at a greater depth from parting-line *F* than the flat sealing surface *E*, such swivelling action will cause the engraved side of the block *C* to move progressively away from the slotted side wall of the cavity, and therefore to leave the side of the casting. Thus as the casting is brought out of the cavity the core portions for the panelled inscription will be automatically stripped from the casting.

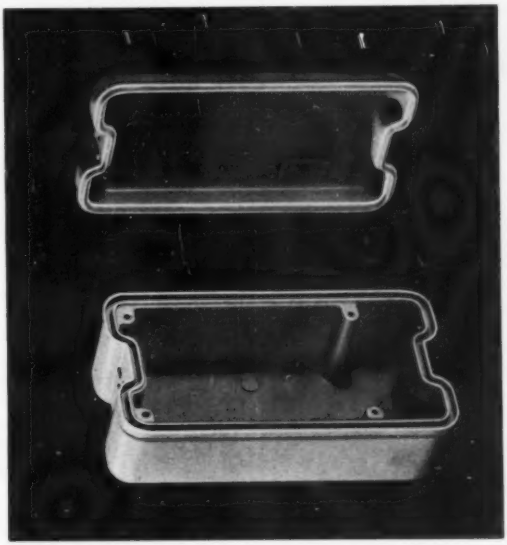
When the casting is completely removed from the cavity formation the blocks *C* will occupy a position approximately as shown, with the apex *X* lying well within the center of the fulcrum pin *D*. A little additional swivelling movement may be permitted these members, but the rear side wall of the block should bear against the inclined end wall of the slot before apex *X* is brought too close to the center line of the fulcrum pin.

This ejection movement may be performed at the normal quick speed, since the two opposed blocks *C* will have only a slight amount of movement radially.

After the spray of castings with runner/sprue waste has fallen completely through the die, the movable block will be closed, which as it approaches the stationary die *A* will bear upon points *X*, thus pressing back the swivelling blocks *C* into the proper casting position in readiness for the next injection shot.

It will be desirable to locate the fulcrum pin *D* moderately close to the side of the cavity, as practicable, in order to derive the greatest degree of lateral withdrawal of the critical end-face of the blocks *C* for any given amount of radial movement.

Use of a coring provision of this simple character will also often afford great convenience by reason of the fact that two relatively small swivelling blocks may be mounted to work



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effectively in a much smaller die member than would be required were the customary retracting slides employed.

The method will prove satisfactory for lettered and similar inscriptive work which usually are required in light relief, but the same construction has been used by the writer for the reproduction of undercuts ranging up to about 3/16" deep and where the shape of same was conducive to application of a swivelling core of this kind.

The principle of coring is, indeed capable of numerous applications with die casting dies, to replace the more costly, slower working, and mechanically operated core-slides, and/or the disadvantages attaching to use of loose detachable plates.

On the particular example mentioned at the outset, it was found that a very satisfactory

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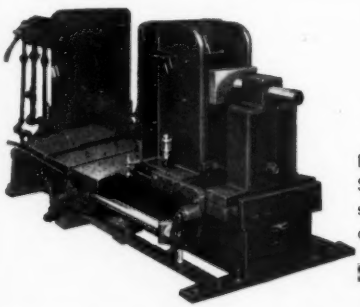

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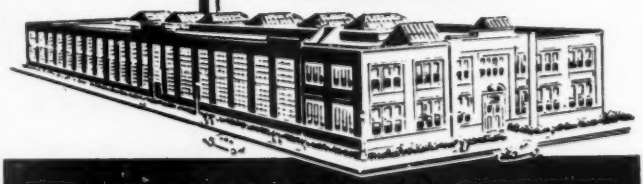

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panelled inscription was obtained, and the very slight fin flashing lying at the line of intersection between core blocks and side of cavity were easily removed by quick sander belt finishing on the side of the casting.

Such core blocks should be well hardened and very accurately fitted to obviate substantial flashing at these points.

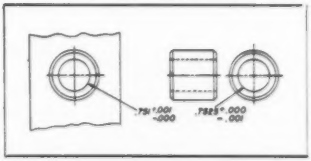
Because of their simple construction, and the inexpensive way in which such blocks could be formed, it was found that no serious expense was involved when replacements became necessary due to natural erosion of the fine outline of the engraved depressed letter formations. Their replacement, in fact, incurred much less expense than would have been necessary with the usual slides.

POWDER METAL SPECS
continued from page 32

0.0005 larger than the hole diameter after assembly; See Figure 6.

(9) *Tolerances* — Use tolerances held by the vendor (see M.P.A. specifications).

(10) *Corners* — It is impossible to fabricate porous metal



6. AN ALLOWANCE of .0005 is made between hole size of bearing and the hole diameter desired in the finished assembly, as shown above.

bearings with sharp corners. They are broken (not a true radius), the minimum break for inside corners being 0.010.

The minimum break on outside corners varies according to wall thickness as follows:

Wall thickness from 0.020 to 0.060, Minimum break 0.015

Wall thickness from 0.060 to 0.110, Minimum break 0.020

Wall thickness from 0.110 to 0.130, Minimum break 0.025

Wall thickness from 0.130 and over, Minimum break 0.030

Dimension notes concerning the break on inside or outside corners of porous metal bearings should always specify the maximum break permissable.

Method of dimensioning:

For method of dimensioning see Figure 7.

Material specifications:

The material specifications should be indicated on the drawing as: "Material — porous bronze" or "Material — porous iron."

The required density (specific

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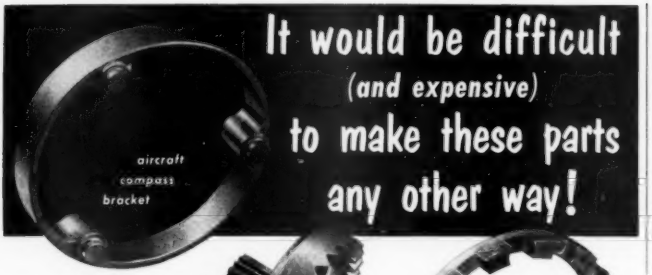

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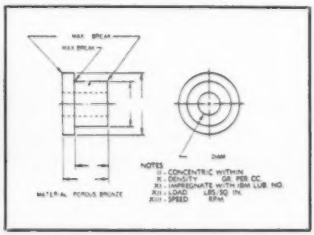
gravity) and impregnation should be stated in the drawing notes. For most applications, an apparent density of 6.4 to 6.8 grams per cubic centimeter should be specified for porous bronze, 5.7 to 6.1 for iron, or 5.8 to 6.2 for iron with 5 to 30 percent copper.

Re-oiling:

Porous metal bearings can be re-oiled if necessary by immersing in the specified lubricant at a temperature of approximately 180 F. for not less than 15 minutes.

Sizing the bearing hole:

Sizing the holes of porous bearings by burnishing does not impair the porosity of the bearing surface if done with a ball type broach or a spiral or multiple step burnishing tool. This should be limited to a maximum increase in diameter of 0.002.



7. METHOD OF DIMENSIONING is illustrated by the above diagram which is a part of specifications set down by IBM.

Drilling, boring, reaming, grinding or other cutting of a porous metal bearing is not recommended because it impairs the porosity of the bearing surface which is essential to its proper function. If, in model work, it is necessary to machine a porous bearing from bronze bar stock or rework an existing bearing, the porosity can be restored by immersing the bearing in a solution of 50 percent nitric acid and 50 percent water for 60 seconds. This treatment will remove approximately 0.002 from all surfaces. The bearing should then be washed to remove all of the acid, burnished to restore a smooth surface and oiled.

OPPORTUNITIES

FOR SALE:
BH 25 alum. die casting machine and BH 30 zinc die casting machine with aluminum conversion unit. Machines are in good condition approximately 5 years old. Write Precision Metal Molding, Box No. 6152.

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Phone: COlfax 1800.

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Two die casting machines, $1500.00 each. Approximately 4 tons Apex No. 2 zinc. Write David Balcher, Balcher Machinery Co., 1884 S. Compton Rd., Cleveland Heights 18, Ohio.

FOR SALE:
Kux Lohner hydraulic zinc die casting machine, Model #BH30; approx. 5 years old used less than 1/3 that time; excellent condition; $6,800. Write Precision Metal Molding, Box No. 6252.

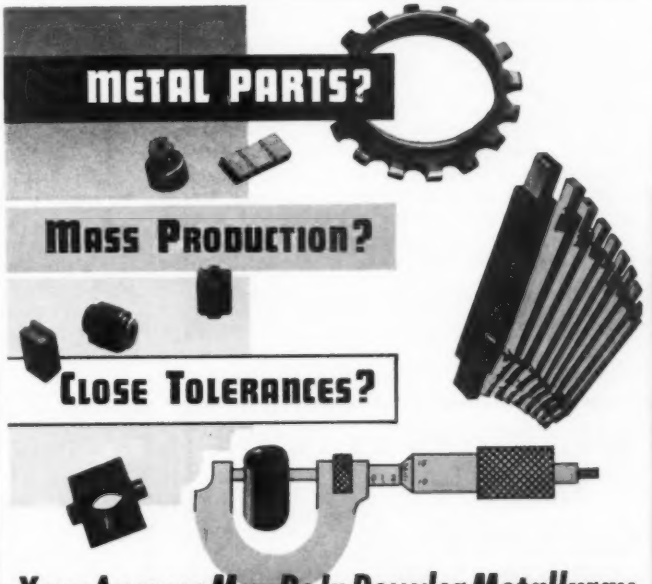
ELECTROFORMING PROCESS CONSERVES MATERIALS, MEETS MILITARY NEEDS

Electroforming, a process used to make fountain pen caps and musical instruments, bells and jewelry, is now being applied to produce parts for military equipment, according to Dr. C. L. Faust and W. H. Safranek of the Electrochemical Engrg. Division at Battelle Memorial Institute, Columbus, Ohio, has revealed.

Speaking before a gathering of metalworking production executives sponsored by the American Society of Tool Engineers at the International Amphitheatre in Chicago, recently, they said that the value of products produced in America by the electroforming process now exceeds $500,000,000.

The electroforming process is a method by which a thick layer of metal is deposited electrically on a form that is later removed from the shape, they explained. Typical military parts now produced by this method include 6-ft. diameter searchlight reflectors, 15 feet radome molds, electro-clad bearings, radar feed horns and computing machine components.

New developments in the process now permit aluminum parts to be shaped by electroforming, the speakers said. An important current advantage of the process is that it conserves critical materials because parts can be produced to finished size, requiring little removal of excess material to complete them.



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NON-STANDARD PINIONS
continued from page 34

corrosion resistance is as good or better than the replaced material and the cost is materially lowered.

The pinions made by the Powdered Metal Products Corp. of Chicago, Illinois, are fabricated from a mixture of iron and copper powders. After sintering, they are coined to secure the close dimensional tolerances required.

After delivery to the purchaser, the parts are hardened by pack carburizing. This process at first gave some trouble as growth of the gears was experienced during the hardening operation. The cycle finally determined was to pack carburize at 1700 F. for four hours and cool to room temperatures in the pack. After cooling, the pinions are removed from the pack and reheated in a controlled atmosphere furnace to 1840 F., held for one hour and then quenched in oil. Following heat treatment, the gears are Parkerized, using a standard procedure.

When compared with copper plated mild steel and with zinc plated hardened steel pinions, the powdered iron gears showed considerably improved wear resistance. On life tests the powdered iron pinions gave five times the life of mild steel and double the life of hardened steel.

The corrosion testing on the powdered iron pinion after protective treatment showed 50 hours resistance in the salt spray test, adequate resistance to hot acetic acid, both liquid and vapor, and adequate resistance to lactic acid liquid and vapor. The corrosion resistance tests showed the new pinion to be equal to or superior to the parts they replaced.

As mentioned above, the new powdered iron pinion is less expensive than the pinions it replaces, and additional savings result from the stocking of one part in place of three.

EXPOSED TO HEAT
continued from page 33

using the same plating sequence it uses for plating other aluminum forms.

The castings are produced for Majestic by Junior-Pro Products of St. Louis, using an alum-

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inum alloy containing 4 percent copper and 6 percent silicon.

One functional advantage, in addition to heat resistance, obtained by using aluminum permanent mold in place of the molded plastic, has been the ability to fill in a recess in the rear of the bracket. This cored recess was necessary in the plastic to equalize the wall section and facilitate the curing process. The recess in the rear of the handle bracket has proved to be a dirt-catcher which is difficult to clean. Its position on the front of the stove makes it particularly receptive to drippings and food particles. By filling in the recess on the aluminum castings, the handles no longer catch dirt and are easy to clean.

Although considerable saving could be achieved by the use of aluminum without chromium plating, this has been felt to be necessary in order to match the other plated trim on the stove.

WAGNER BROS. EXPANDS

J. R. Wagner, president, Wagner Brothers, Inc., Detroit, Michigan has announced the completion of the new wing which will house additional anode production facilities. This is a continuation of a plant expansion program which began in 1948. Built of structural steel and cinder block the building is now ready for production.

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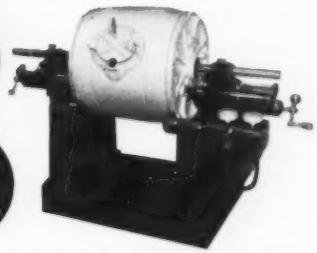

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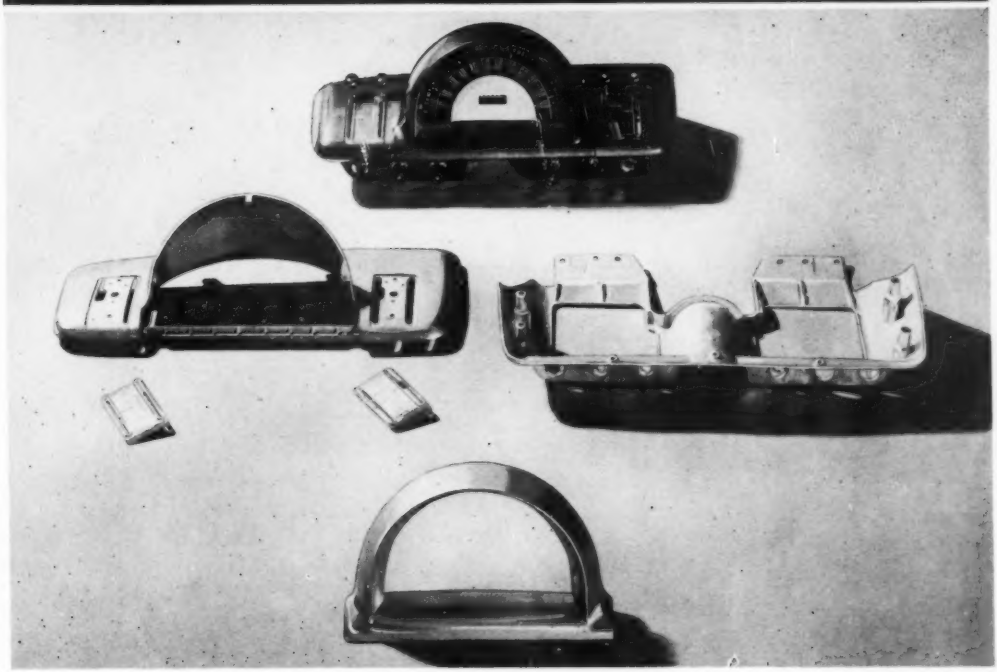

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